Instruction Manual
Form 5335
June 1995

FIELDVUE™ Digital Valve Controller Type DVC5000 Series

Contents

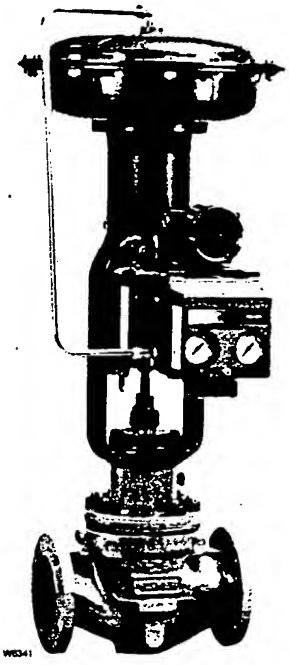

Figure 1. Sliding-Stem Control Valve with Type DVC5010 Digital Valve Controller

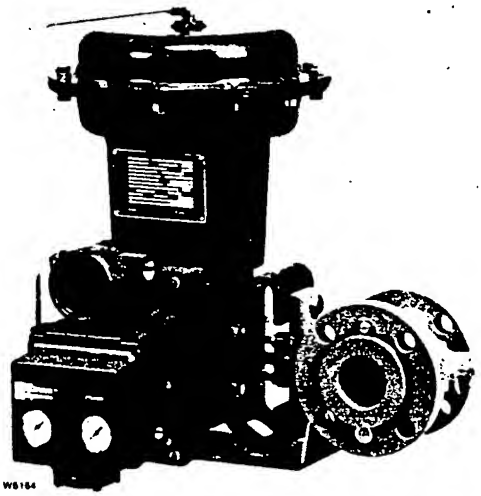

Figure 2. Rotary Control Valve with Type DVC5020 Digital Valve Controller

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Contents (continued)

Introduction

Scope of Manual

This instruction manual includes specifications, installation, and operating information for the Type DVC5000 Series digital valve controller.

Description

FIELDVUE™ DVC5000 Series digital valve controllers (figures 1 and 2) are communicating, microprocessor-based current to pneumatic instruments. In addition to the normal function of converting an input current signal to a pneumatic output pressure, the DVC5000 Series digital valve controller, using the HART® communications protocol, gives easy access to information critical to process operation. You can gain information from the principal component of the process, the control valve itself, using a handheld communicator at the valve or at a field junction box, or by using a personal computer or operator's console within the control room.

Using the HART protocol, information from the field can be integrated into control systems or be received on a single loop basis. The Type DVC5000 Series digital valve controller can also b migrated to Fi ldbus communication protocols.

The Type DVC5000 Series digital valve controller is designed to directly replace standard single-acting valve mounted positioners.

Only qualified personnel should install, operate, and maintain this instrument. If you have any questions concerning these instructions or for information not contained in this instruction manual, contact your Fisher Controls sales office or sales representative for more information.

Installation

Mounting

DVC5010 Sliding-Stem

See figures 3 through 7. Refer to figures 25 through 30 for key numbers.

⚠ WARNING

Avoid personal injury or property damage from sudden release of process pressure or bursting of parts. Before mounting the Type DVC5000 Series digital valve controller:

- **Disconnect any operating lines providing air pressure, electric power, or a control signal to the actuator. Be sure the actuator cannot suddenly open or close the valve.**
- **Use bypass valves or completely shut off the process to isolate the valve from process pressure. Relieve process pressure from both sides of the valve. Drain the process media from both sides of the valve.**
- **Vent the pneumatic actuator loading pressure and relieve any actuator spring precompression.**
- **Use lock-out procedures to be sure that the above measures stay in effect while you work on the equipment.**

1. Isolate the control valve from the process line pressure, release pressure from both sides of the valve body, and drain the process media from both sides of the valve. Shut off all pressure lines to the pneumatic actuator, releasing all pressure from the actuator. Use lock-out procedures to be sure that the above measures stay in effect while you work on th equipment.

Table 1. Specifications

Electrical Classification

Hazardous Area: Explosion-proof, Division 2, and flameproof constructions are available. Refer to Hazardous Area Classification Bulletins 9.2:001(EXP), 9.2:001(DIV2), and 9.2:002. Intrinsic safety approvals are pending
Electrical Housing: Designed to meet NEMA 4X, IEC 529 IP65

Electrical Input

Analog Input Signal: 4 to 20 mA dc user configurable. Minimum available system voltage 12Vdc (see the Wiring Practices section in this manual for details

CAUTION

Do not connect the Type DVC5000 digital valve controller directly to a voltage source when implementing the point-to-point wiring mode or damage to the pwb assembly submodule may result. In the point-to-point wiring mode, the Type DVC5000 digital valve controller may only be connected to a 4-20 mA current source.

Minimum Control Current: 4.0 mA
Minimum Current w/o Microprocessor Restart: 3.5 mA
Maximum Current: 100 mA

Reverse Polarity Protection: No damage occurs from reversal of normal supply current (4-20 mA)

Output Pressure(1)

Ranges: As required by the actuator, up to 95% of supply pressure
Minimum Span: 6 psig (0.4 bar)
Maximum Span: 90 psig (6 bar)

Supply Pressure(1)

Minimum and Recommended: 5 psig (0.3 bar) higher than maximum actuator requirements
Maximum: 100 psig (6.5 bar)

Operating Ambient Temperature Limits

–40°F to 175°F (–40°C to 80°C)

Independent Linearity(1)

±0.5% of output span

Connections

Supply Pressure: 1/4-inch or R 1/4 NPT female and integral pad for mounting 67AFR regulator
Output Pressure: 1/4-inch or R 1/4 NPT female
Vent (pipe-away): 1/4-inch or R 1/4 NPT female
Electrical: 1/2-inch NPT female, M20 female, or G 1/2 parallel (bottom entrance)

Mounting

Designed for direct actuator mounting. For weatherproof housing capability, the instrument must be mounted upright to allow the vent to drain

Weight

Less than 6 lbs (2.7 Kg)

1. Defined in ISA Standard S51.1-1979.

WARNING

To avoid personal injury due to the sudden uncontrolled movement of parts, do not loosen the stem connector cap screws on a Type 667 actuator when the stem connector has spring force applied to it. Apply enough pressure to lift the plug off the seat before loosening the stem connector cap screws.

2. For Type 657, 667, 1250, and 1250R actuators, attach the connector arm (key 108) to the valve stem connector.

For Type 513 and 513R size 20 actuators, loosen the lower lock nut below the travel indicator disc. Insert the connector arm (key 108) between the lock nuts and tighten the lower lock nut against the connector arm. For Type 513 and 513R size 32 actuators, attach the spacers (key 119) and connector arm (key 108) to the valve stem connector with screws (key 120).

3. Attach the mounting bracket (key 107) to the housing (key 1) with screws (key 104).

4. For Type 657 and 667 actuators, if valve travel exceeds 2 inches, a feedback arm extension (key 97) is required. Remove the bias spring (key 78) for up to 2-inch travel from the feedback arm (key 79). Attach the bias spring (key 78) for up to 4-inch travel to the feedback arm extension. Attach the feedback arm ex-

t nsion to the feedback arm with screw (key 98), screw (key 99), spacer (key 101), lock washers (key 162), and hex nuts (key 100). Remov the pipe plug (key 61) from the output connection on the back of the housing, apply sealant (key 64), and reinstall in the output connection on the side of the housing.

5. For Type 657 and 667 actuators, loosely install a hex flange screw (key 105) in the right hole of the lower actuator mounting boss.

For Type 1250 and 1250R actuators, loosely attach the mounting bracket (key 107) to the leg post with U-bolts (key 114), washers (key 127), and hex nuts (key 115). Position the digital valve controller vertically so that the terminal box clears the diaphragm casing of the actuator. Tighten the hex nuts, securing the mounting bracket to the leg post.

6. For Type 657 and 667 actuators, position the digital valve controller so the hole in the mounting pad of the mounting bracket goes onto the mounting screw (key 105). Slide the digital valve controller to the left to expose the left hole. Install the left screw (key 105). Tighten both screws (key 105).

For Type 513 and 513R actuators, insert the screws (key 155) and washers (key 122) through the slot and hole in the mounting bracket (key 107). Install the spacers (key 118) and tighten the screws.

Note

The alignment pin (key 46) is stored inside the housing (key 1). It is located above the supply pressure gauge (key 47).

7. Set th position of the f edback arm (key 79) on the digital valve controll r by inserting the alignment pin (key 46) through the hole on the feedback arm marked "A" for Type 667, 513R, or 1250R actuators or the slot marked "B" for Type 657, 513, or 1250 actuators.

8. Apply lubricant (key 63) to the pin portion of the adjustment arm (key 106). Place the pin into the slot of the feedback arm (key 79) so that the bias spring loads the pin against the side of the arm with the valve travel markings.

9. Install the external lock washer (key 110) on the adjustment arm. Position the adjustment arm in the slot of the connector arm (key 108) and loosely install the washer (key 126) and screw (key 109).

10. For Type 1250 and 1250R actuators, loosely attach the brace (key 111) to the mounting bracket (key 107) with screws (key 112), washers (key 123), and hex nuts (key 115). Attach the brace (key 111) to the leg post with U-bolts (key 114), washers (key 127), and hex nuts (key 115). Tighten the screws and hex nuts (keys 112 and 115).

For all actuators, slide the adjustment arm pin in the slot of the connector arm until the pin is in line with the desired valve travel marking. Tighten the screw (key 109).

11. Remove the alignment pin (key 46) and store in the module base next to the I/P assembly.

12. Attach the shield (key 102) with two screws (key 103). Note that on Type 657 or 667 size 70-100 actuators, the screws are started before installing the shield.

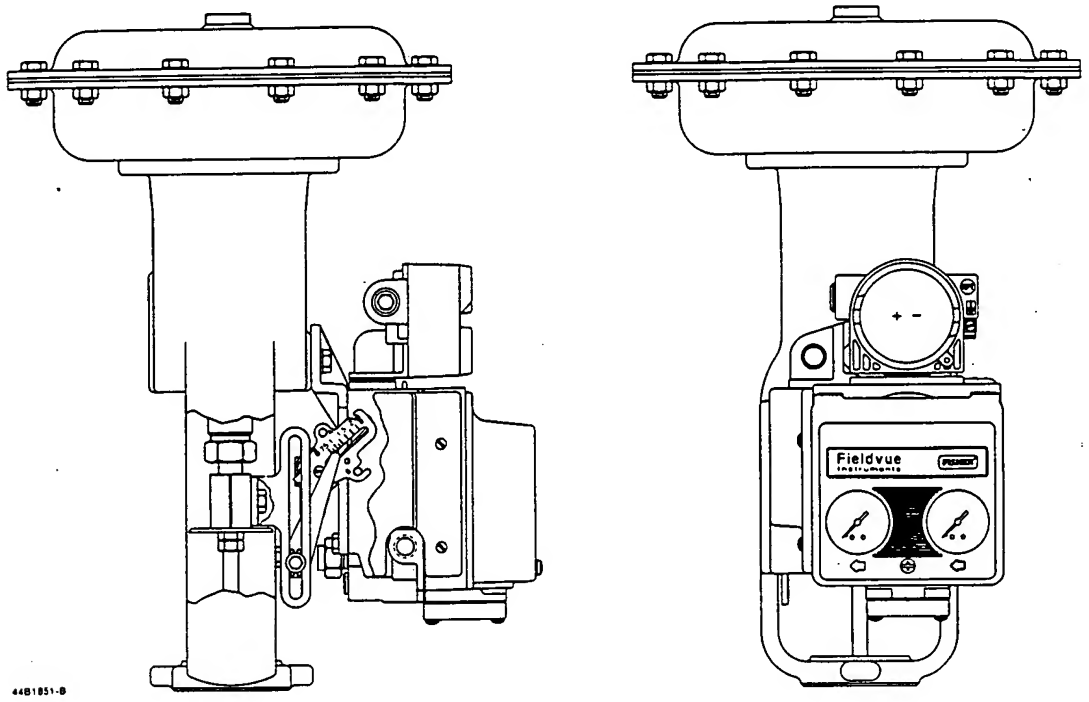


Figure 3. Type DVC5000 Yoke-Mounted on Type 657/667 Size 30-60 Actuator

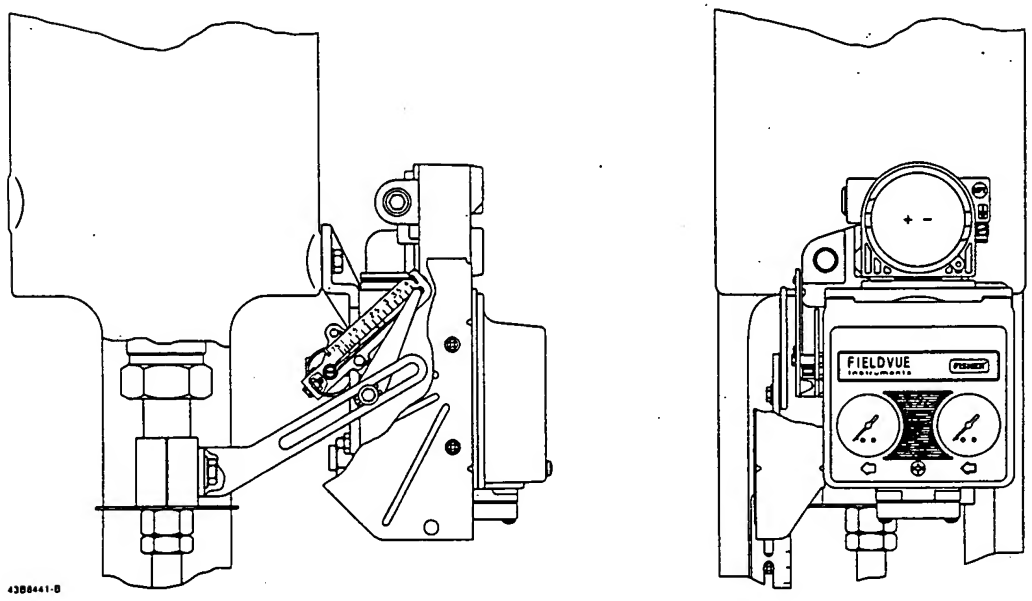


Figure 4. Type DVC5010 Yoke-Mounted on Type 657/667 Size 70-100 Actuator

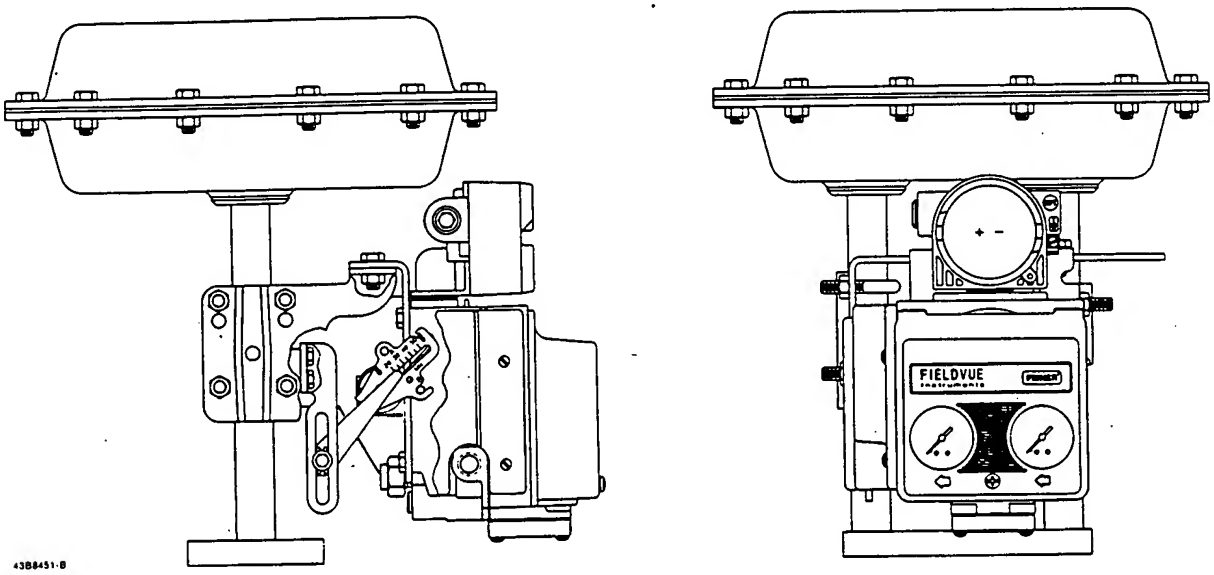


Figure 5. Type DVC5010 Yoke-Mounted on Type 1250 Actuator

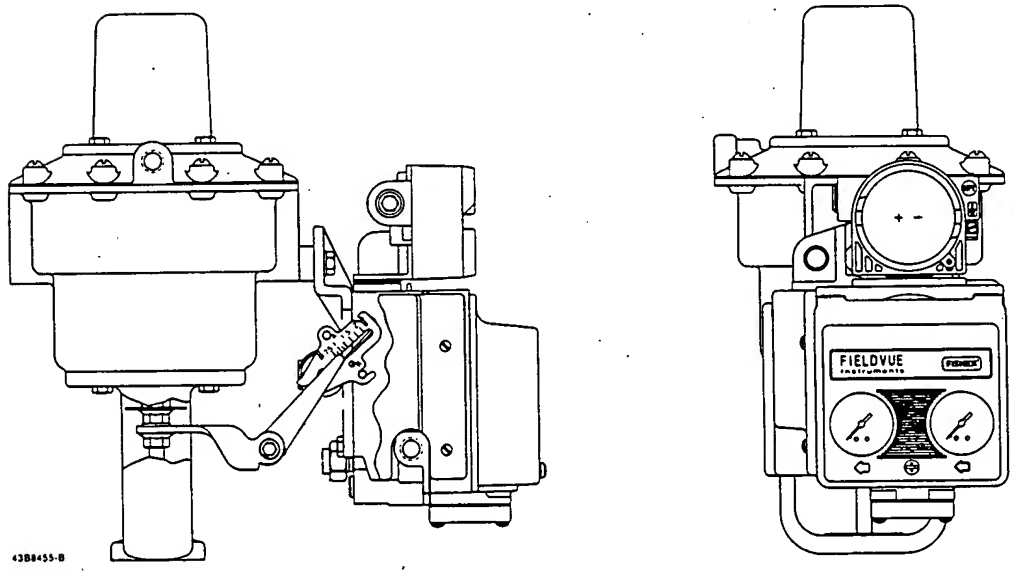


Figure 6. Type DVC5010 Yoke-Mounted on Type 513 Size 20 Actuator

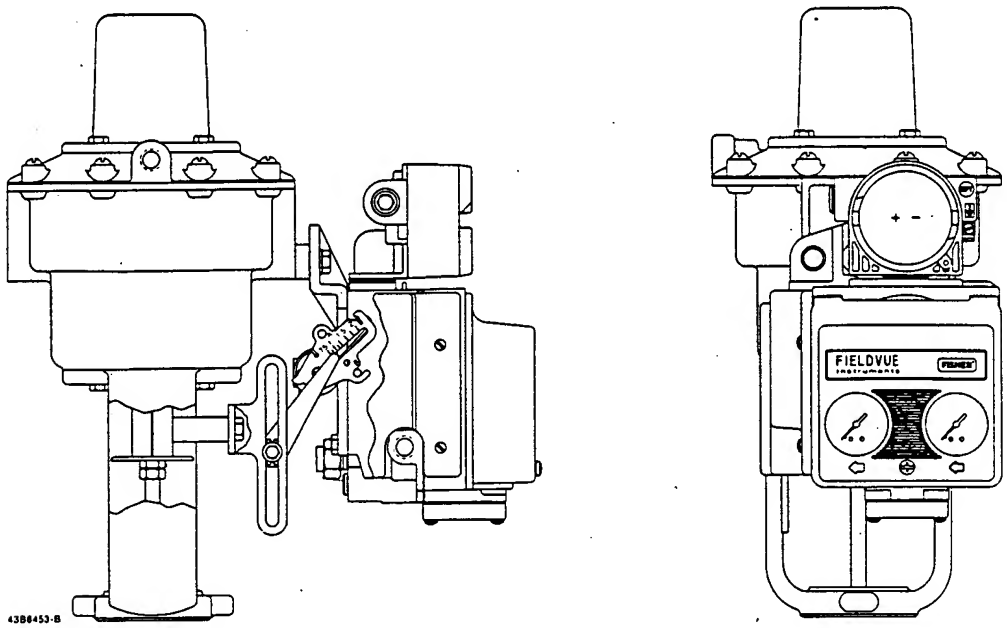


Figure 7. Type DVC5010 Yoke-Mounted on Type 513 Size 32 Actuator

DVC5020 Rotary

See figure 8 or 9. Refer to figure 31 and 32 for key numbers.

WARNING

Avoid personal injury or property damage from sudden release of process pressure or bursting of parts. Before mounting the Type DVC5000 Series digital valve controller:

- **Disconnect any operating lines providing air pressure, electric power, or a control signal to the actuator. Be sure the actuator cannot suddenly open or close the valve.**
- **Use bypass valves or completely shut off the process to isolate the valve from process pressure. Relieve process pressure from both sides of the valve. Drain the process media from both sides of the valve.**
- **Vent the pneumatic actuator loading pressure and relieve any actuator spring precompression.**
- **Use lock-out procedures to be sure that the above measures stay in effect while you work on the equipment.**

Note

Proceed to step 12 if the actuator already has the cam (key 94) installed.

1. Isolate the control valve from the process line pressure, release pressure from both sides of the valve body, and drain the process media from both sides of the valve. Shut off all pressure lines to the pneumatic actuator, releasing all pressure from the actuator. Use lock-out procedures to be sure that the above measures stay in effect while working on the equipment.

2. Mark the positions of the travel indicator and actuator cover. Then, remove the actuator travel indicator machine screws, travel indicator, and actuator cover cap screws.

3. Remove the cover plate from the actuator housing.

4. For actuator styles A and D, proceed to the note before step 8. For actuator styles B and C, continue with step 5.

5. Disconnect the actuator turnbuckle from the lever arm.

Note

Do not change the position of the rod end bearing on the end of the turnbuckle.

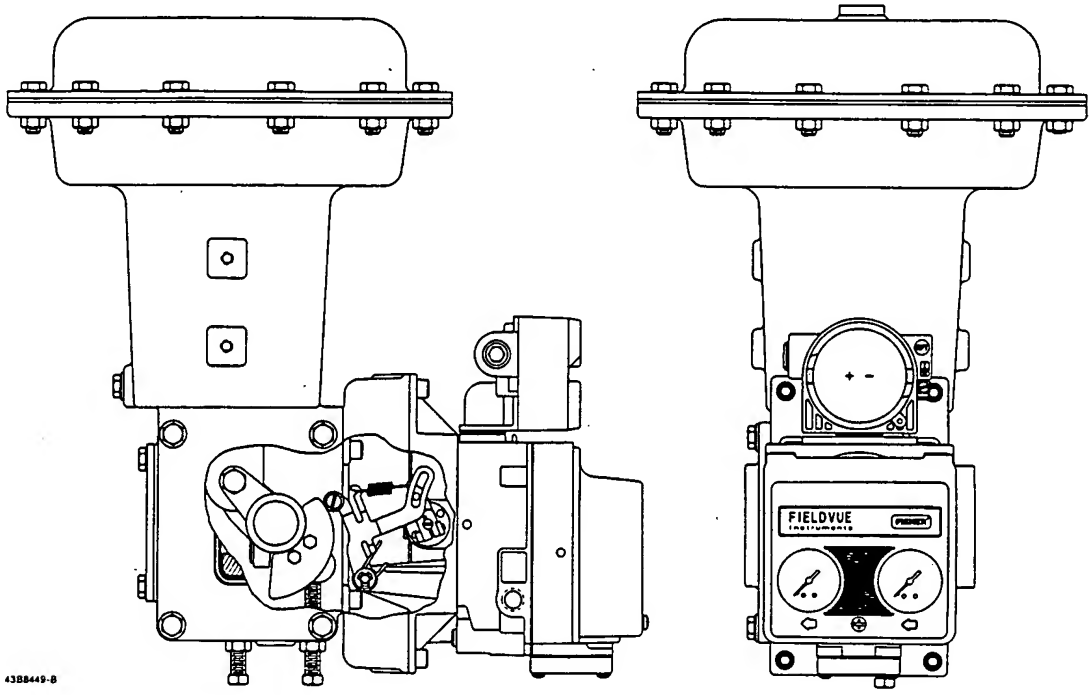


Figure 8. Type DVC5020 Mounted on Type 1052 Size 33 Actuator

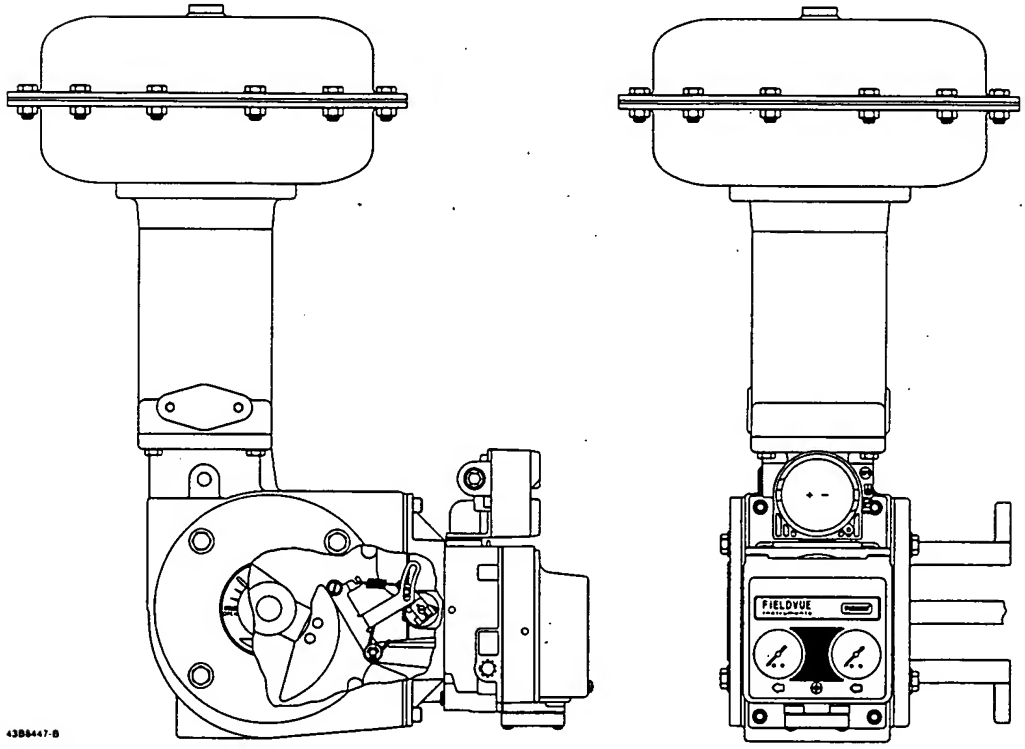


Figure 9. Type DVC5020 Mounted on Type 1051 Size 40 Actuator

6. Loosen the lever clamping bolt in the lever.

7. Mark the lever/valve shaft orientation, and remove the lever.

Note

Linear Cam A—Cam A has the letter D (direct acting) on one side and the letter R (reverse acting) on the other side. Always install cam A with the letter D on the same side as cam mounting screw heads (key 94).

8. Install the cam (key 94) on the actuator lever with the cam mounting screws (key 95).

9. For actuator styles A and D, proceed to step 12. For actuator styles B and C, continue with step 10.

10. Slide the lever/cam assembly (cam side first) onto the valve shaft. Orient the lever with the shaft as noted in previous step 6, and tighten the lever clamping bolt.

Note

Refer to the appropriate actuator instruction manual to determine the distance required between the housing face and the lever face and to determine the proper tightening torque for the lever clamping bolt.

11. Connect the turnbuckle and the lever arm.

12. **For Type 1051 size 33 and 1052 size 20 and 33 actuators,** attach an adaptor (key 117) to the actuator with four screws (key 116). Then assemble the digital valve controller assembly to the adaptor. The roller on the digital valve controller feedback arm will contact the actuator cam as it is being attached. Install and tighten four screws (key 116).

For other size actuators, assemble the digital valve controller assembly to the front access opening of the actuator. The roller on the digital valve controller feedback arm will contact the actuator cam as it is being attached. Install and tighten four screws (key 116).

13. Replace the actuator cover and the travel indicator in the positions that were marked in step 2.

Note

Actuator cover alignment on the Type 1052 actuator can be aided by moving the actuator slightly away from its up travel stop using a regulated air source. If hole alignment cannot be obtained in this manner, temporarily loosen the cap screws that secure the housing to the mounting yoke, and shift the housing slightly. Do not completely stroke the actuator while the cover is removed.

Filter Regulator

A Type 67AFR filter regulator, when used with the Type DVC5000 Series digital valve controller, can be mounted three ways.

For integral mounting to the digital valve controller, O-ring (key 60) must be lubricated and in place on the digital valve controller. Proceed to attach the Type 67AFR filter regulator to the side of the digital valve controller. This is the standard method of mounting the filter regulator. Refer to figure 10.

For optional yoke mounting, mount the filter regulator with 2 screws (key 59) to the pre-drilled and tapped holes in the actuator yoke. Thread a 1/4-inch socket-head pipe plug (key 61) into the plug side outlet on the filter regulator. The O-ring (key 60) is not required.

For optional casing mounting, use the separate Type 67AFR filter regulator casing mounting bracket provided with the filter regulator. Attach this mounting bracket to the Type 67AFR and then attach this assembly to the actuator casing. Thread a 1/4-inch socket-head pipe plug (key 61) into the plug side outlet on the filter regulator. The O-ring (key 60) is not required. Refer to figure 11.

Pneumatic Connections

All pressure connections on the digital valve controller are 1/4-inch NPT or R 1/4 female connections. Use 3/8-inch (10 mm) tubing to these connections. If remote venting is required, refer to the vent subsection below. Typically, 3/8-inch (10 mm) outside diameter tubing is used from the 1/4-inch NPT or R 1/4 digital valve controller output connection to the pneumatic actuator input connection.

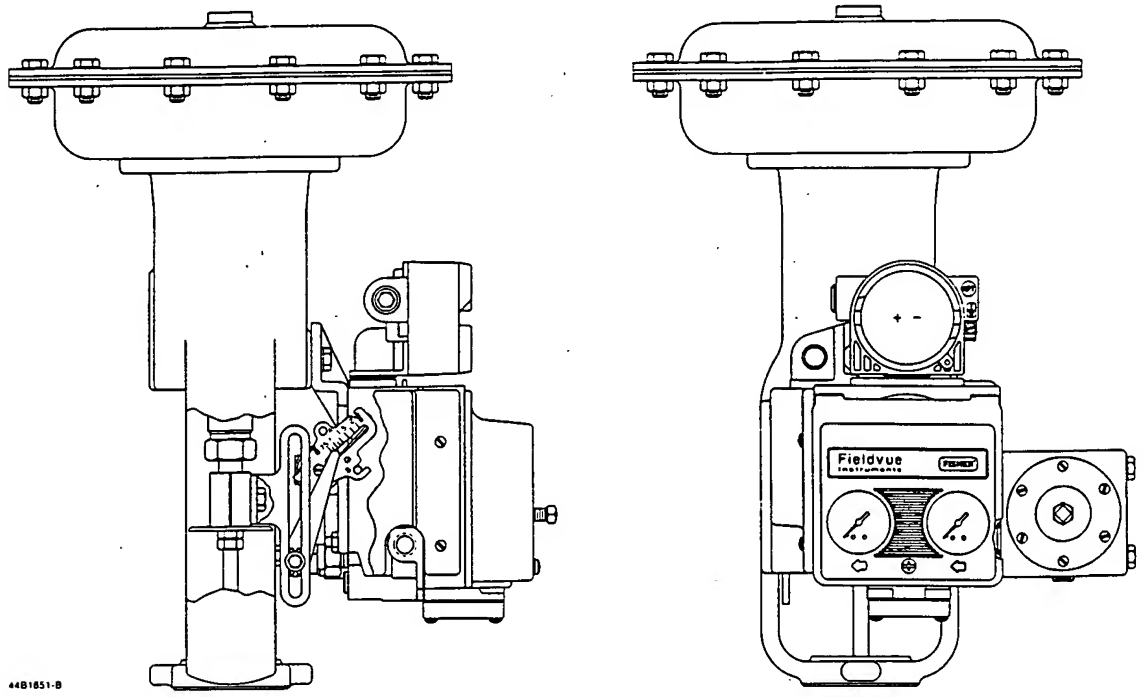


Figure 10. Integrally Mounted Filter Regulator

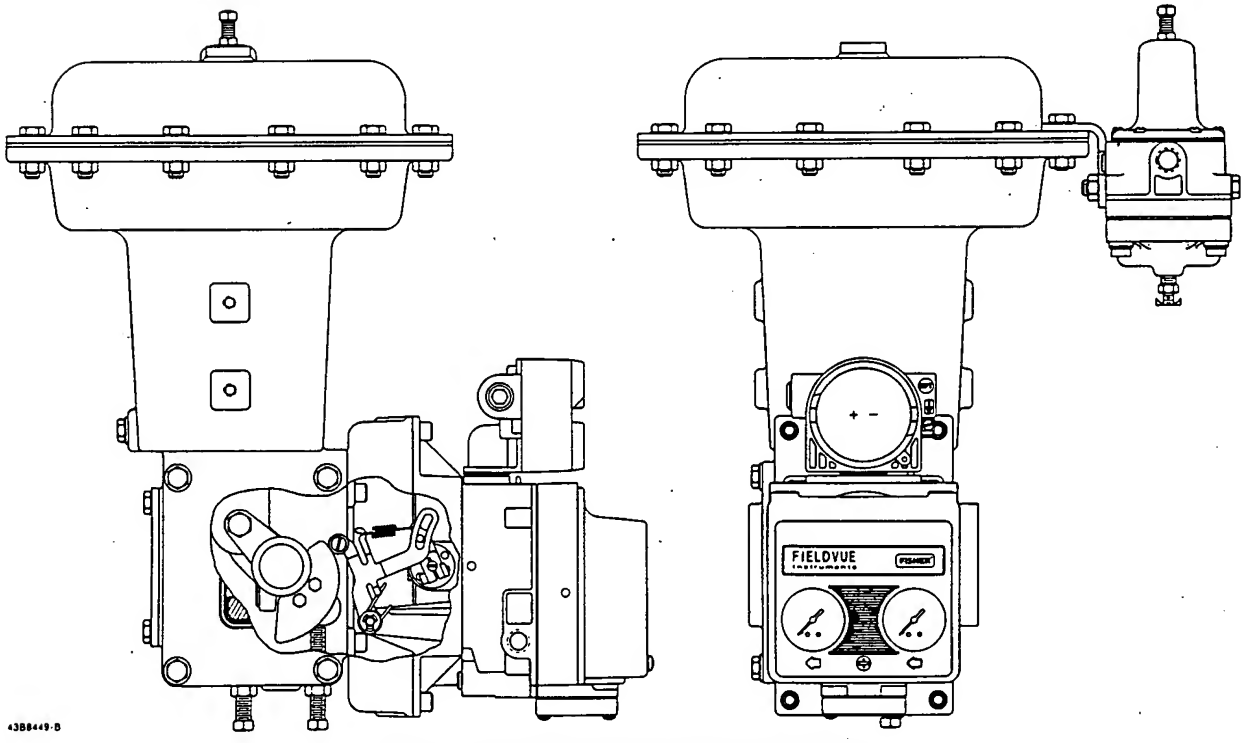


Figure 11. Optional Casing-Mounted Filter Regulator

Supply Pressure R quirements

WARNING

Personal injury or property damage may occur from an uncontrolled process if the supply medium is not clean, dry, oil-free, or noncorrosive gas. Industry instrument air quality standards describe acceptable dirt, oil, and moisture content. Due to the variability in nature of the problems these influences can have on pneumatic equipment, Fisher Controls has no technical basis to recommend the level of filtration equipment required to prevent performance degradation of pneumatic equipment. A filter or filter regulator capable of removing particles 40 microns in diameter should suffice for most applications. Use of suitable filtration equipment and the establishment of a maintenance cycle to monitor its operation is recommended.

Supply pressure must be clean, dry air or noncorrosive gas. A Fisher Controls Type 67AFR filter regulator, or equivalent, may be used to filter and regulate supply air. A filter regulator can be integrally mounted onto the side of the digital valve controller, casing mounted separate from the digital valve controller, or mounted on the actuator mounting boss. Supply and output pressure gauges may be supplied on the digital valve controller. The output pressure gauge can be used as an aid for calibration.

Connect the nearest suitable supply source to the1/4-inch NPT IN connection on the filter regulator (if furnished) or to the 1/4-inch NPT SUPPLY connection on the digital valve controller housing (if Type 67AFR filter regulator is not attached).

V nt

WARNING

If a flammable, toxic, or reactive gas is to be used as the supply pressure medium, personal injury and property damage could result from fire or explosion of accumulated gas or from contact with toxic or reactive gas. The digital valve controller/actuator assembly does not form a gas-tight seal, and when the assembly is in an enclosed area, a remote vent lin , ad quate ventilation, and necessary safety measures should be used. A remote vent pipe alone cannot be relied upon to remove all hazardous gas. Vent lin piping should comply with local and regional codes and should be as short as possible with adequat inside diameter and few bends to remove exhaust gases to a ventilated area.

If a remote vent is required, the vent line must be as short as possible with a minimum number of bends and elbows.

To connect a remote vent on Type DVC5010 digital valve controllers—sliding-stem, remove the plastic vent (key 52 in figure 24). The vent connection is 1/4-inch NPT or R 1/4 female. Typically, 3/8-inch (10 mm) tubing is used to provide a remote vent.

To connect a remote vent on Type DVC5020 digital valve controllers—rotary, follow the disassembly instructions per *Type DVC5020 Rotary Feedback Arm* in this manual. Install a pipe plug (key 127) in the vent-away mounting bracket (key 74). Replace the standard mounting bracket (key 74) with the vent-away mounting bracket (key 74). Follow reassembly instructions per *Type DVC5020 Rotary Feedback Arm* in this manual.

Electrical Connections

The digital valve controller is normally powered by a control system output card.

CAUTION

Do not connect the digital valve controller directly to a voltage source when implementing the point-to-point wiring mode, or damage to the pwb assembly submodule may result. In point-to-point wiring mode, the digital valve controller may only be connected to a 4-20 mA current source.

Wire the digital valve controller as follows: (refer to figure 24 for identification of parts).

1. Remove the terminal box cap (key 4) from the terminal box (key 3).

2. Bring the field wiring into the terminal box. When applicable, install conduit using local and national electrical codes which apply to the application.

3. Connect the positive wire from the control system output card "current output" to the "LOOP +" screw terminal on the pwb/terminal strip assembly in the terminal box. Connect the negative (or return) wire from the control system output card to the "LOOP –" screw terminal in the terminal box as shown in figure 12.

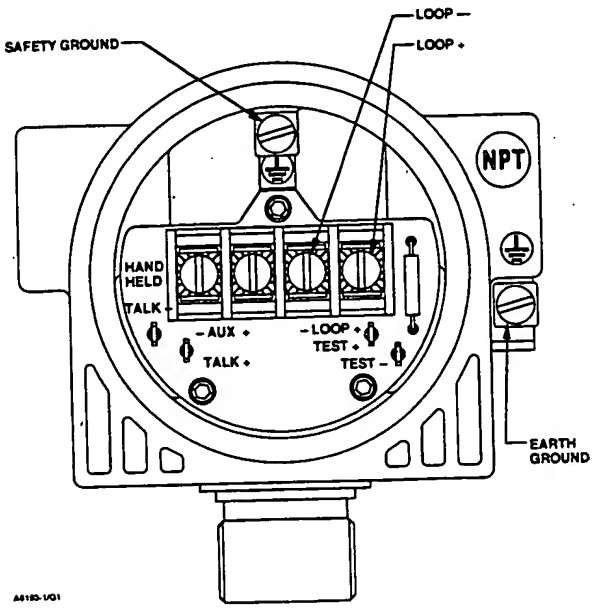


Figure 12. Type DVC5000 Series Digital Valve Controller Terminal Box

WARNING

Personal injury or property damage can result from the discharge of static electricity. Connect a 14 AWG (2.08 mm²) ground strap between the digital valve controller and earth ground when flammable or hazardous gases are present. Refer to national and local codes and standards for grounding requirements.

4. Connect the safety ground and the earth ground as shown in figure 12. Replace and hand tighten the cover on the terminal box. When the loop is ready for startup, apply power to the control system output card.

Test Connections

WARNING

Personal injury or property damage caused by fire or explosion may occur if this test is attempted in an area which contains a potentially explosive atmosphere or has been classified as hazardous.

C nfirm that area classification and atmosphere conditions permit the safe removal of the terminal box cap before proceeding.

Test connections inside the terminal box can be used to measure loop current across a 1 ohm resistor.

1. Remove the terminal box cap.

2. Adjust the test meter to measure a range of 0.001 to 0.1 volts.

3. Connect the positive lead of the test meter to the **Test +** connection and the negative lead to the **Test –** connection inside the terminal box.

4. Measure Loop current as:

1000 × voltage (on test meter) = milliamps

example:

Test meter Voltage Loop Milliamps

0.004 = 4.0

0.020 = 20.0

5. Remove test leads and replace the terminal box cover.

Communication Connections

WARNING

Personal injury or property damage caused by fire or explosion may occur if this test is attempted in an area which contains a potentially explosive atmosphere or has been classified as hazardous.

Confirm that area classification and atmosphere conditions permit the safe removal of the terminal box cap before proceeding.

The **TALK +** and **TALK –** connections inside the terminal box can be used to provide local communications with the instrument.

Configuration Protection Jumper

FIELDVUE instruments which use the Auxiliary terminals as a transmitter input (see table 2) require the use of the configuration jumper shown in figure 13. This jumper is temporarily attached to the **AUX +** and **AUX –** terminals in the instrument terminal box and is used to remove configuration protection from the instrument. Details of configuration protection can be found in the *FIELDVUE Instrument Communication Manual - Form 5345* and also in the *FIELDVUE ValveLink Users Guide.*

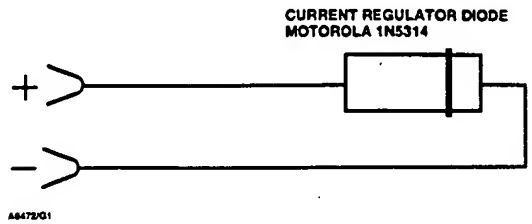


Figure 13. Configuration Protection Jumper

FIELDVUE instruments which use the Auxiliary terminals as a switch input (see table 2) can use the configuration jumper shown in figure 13 or a piece of wire with clips.

Initial Setup

The Type DVC5000 Series digital valve controller is preconfigured at the factory. When mounting to a valve in the field, the following items should be verified to assure proper operation:
Zero Control Signal
Feedback Char
Invert Feedback
Supply Pressure
Tuning Set
Travel Cutoff
Control Mode
Instrument Mode

See the *FIELDVUE Instrument Communications Manual - Form 5345* or the *FIELDVUE ValveLink Users Guide* for information on changing instrument configuration.

The DVC5000 Series digital valve controller is shipped from the factory with the mode switch configured for Point-to-Point. For multidrop installations, change the mode switch configuration to Multidrop (see table 2).

Principle of Operation

Using a notebook or other IBM compatible PC and FIELDVUE Diagnostics Software, or a handheld communicator, you can perform several operations with the Type DVC5000 Series digital valve controller. You can obtain general information concerning software revision level, messages, tag, descriptor, and date. Diagnostic information is available to aid you when troubleshooting. Both input and output configuration parameters can be set. The Type DVC5000 Series digital valve controller can be calibrated via the notebook PC or handheld communicator.

The Type DVC5000 Series digital valve controllers have a single master module which may be easily replaced in the field without disconnecting field wiring or tubing. This master module contains the following submodules: I/P converter, pwb (printed wiring board) assembly, and pneumatic relay. The master module can be rebuilt by replacing the submodules. See figure 14 and figure 15.

The Type DVC5000 Series digital valve controller is a loop-powered instrument that provides a control valve position proportional to an input signal from the control room. The following describes a direct acting Type DVC5010 digital valve controller mounted on a Type 657 actuator.

The input signal is routed into the terminal box through a single pair of twisted wires and then to the pwb assembly submodule where it is read by the microprocessor, processed by a digital algorithm, and converted into an analog I/P drive signal.

As the input signal increases, the drive signal to the I/P converter increases. This makes the magnetic attraction between the core and armature of the I/P converter increase, causing the flapper to restrict the nozzle, which increases the nozzle pressure. The nozzle pressure is routed to the input diaphragm of the pneumatic relay submodule. As the nozzle pressure increases, the pneumatic relay diaphragm assembly moves, causing the valve plug to open the supply port and close the exhaust port, increasing the output pressure to the actuator. The increased output pressure causes the actuator stem to move downward. Stem position is sensed through the feedback linkage by a precision plastic film potentiometer which is electrically connected to the pwb assembly submodule. The stem continues to move downward until the correct stem position is attained. At this point the pwb assembly stabilizes the I/P drive signal. This positions the flapper to prevent any further increase in nozzle pressure.

As the input signal decreases, the drive signal to the I/P converter submodule decreases, decreasing the nozzle pressure. The pneumatic relay diaphragm assembly moves causing the valve plug to close the supply port and open the exhaust port, releasing the actuator casing pressure to atmosphere. The stem moves upward until the correct position is attained. At this point the pwb assembly stabilizes the I/P drive signal. This positions the flapper to prevent any further decrease in nozzle pressure.

The HART protocol allows communication with the Type DVC5000 Series digital valve controller over the same single twisted pair of wires that supply the input signal to the digital valve controller. This is accomplished by superimposing two individual frequencies of 1200 and 2200 Hz as a sinewave over the 4-20 mA loop. These frequencies represent the digits 1 and 0. This method provides communication to a handheld communicator or personal computer connected via modem, allowing access to parameters dealing with identification, calibration, input-output characteristics, process PID operation, diagnostics, failure mode, and others.

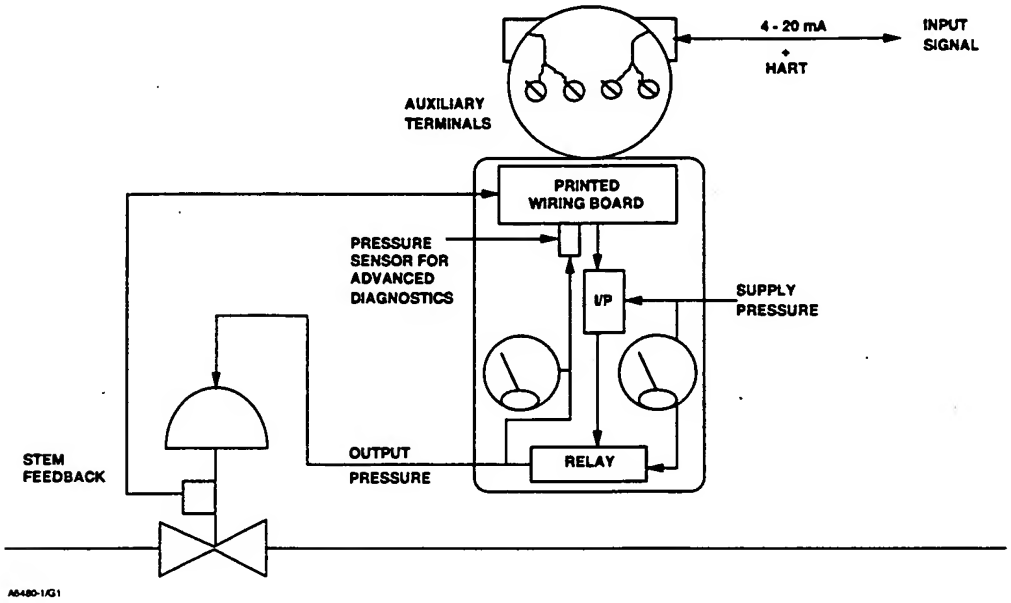


Figure 14. Principle of Operation—DVC5000

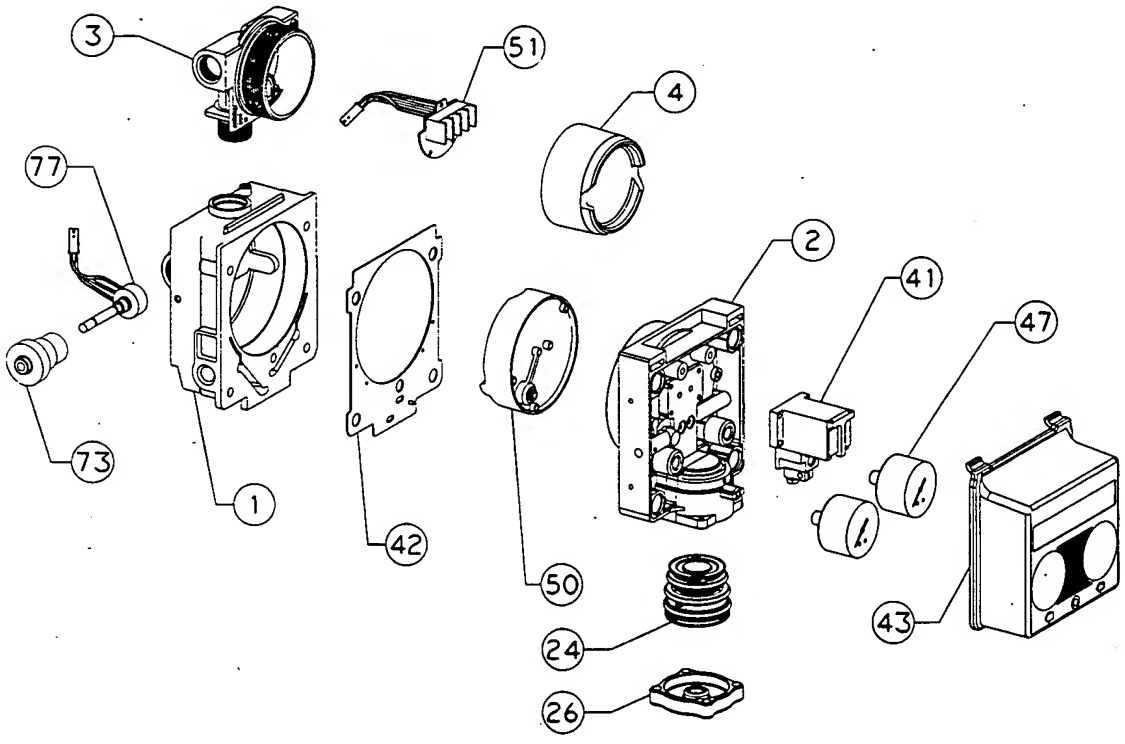


Figure 15. Type DVC5000 Series Digital Valve Controller Assembly

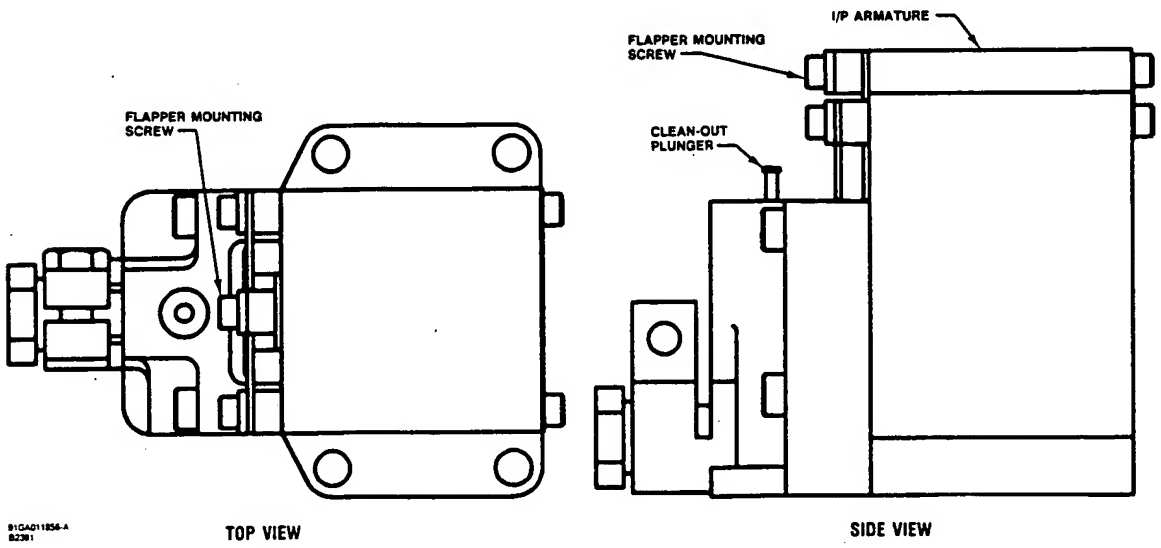


Figure 16. I/P Converter

Maintenance

Note

If the feedback arm (key 79) or feedback arm assembly (key 84) is removed from the Type DVC5000 digital valve controller, the potentiometer (key 77) must be recalibrated.

Because of the diagnostic capability of the Type DVC5000 Series digital valve controllers, predictive maintenance is available through the use of FIELDVUE ValveLink Diagnostics Software. Using the digital valve controller, valve and instrument maintenance can be enhanced, thus avoiding unnecessary maintenance. See Bulletin 62.1:DVC5000 for details of FIELDVUE ValveLink Diagnostics Software capabilities.

Master Module

The digital valve controller contains a master module consisting of the I/P converter, pwb assembly, and pneumatic relay. The master module may be easily replaced in the field without disconnecting field wiring or tubing.

Removing the Master Module

To remove the master module, perform the following steps. Refer to figure 24 for key number locations.

WARNING

To avoid personal injury or equipment damage, turn off the supply pressure to the digital valve controller before attempting to remove the module base assembly from the housing.

1. For sliding-stem applications only, a protective shield (key 102) for feedback linkage is attached to the side of the module base assembly. Remove this shield and keep for reuse on the replacement module. The replacement module will not have this protective shield.
2. Unscrew the captive screw (key 43D) in the cover (key 43) and remove the cover from the module base (key 2).
3. Using a 5/16-inch hex key wrench, loosen the four hex-socket screws (key 38). These screws are captive in the module base by retaining rings (key 154).

Note

The master module is linked to the housing by two cable assemblies. Disconnect these cable assemblies after you pull the master module out of the housing.

4. Pull the master module straight out of the housing (key 1). Once clear of the housing, swing the master module to the side of the housing to gain access to the cable assemblies.
5. The digital valve controller has two cable assemblies which connect the master module, via the pwb

assembly, to the fe dback potentiometer and th terminal box. Disconnect these cable assemblies from the pwb assembly on the back of th master module.

6. Use care to keep the gasket (key 42) and guide surface on the master module clean. Lay the master module on its side on a clean worksurface or place it in a protective enclosure.

CAUTION

To avoid affecting performance of the instrument, take care not to damage the master module gasket or guide surface. Do not bump or damage the bare connector pins on the pwb assembly.

Replacing the Master Module

To replace the master module, perform the following steps. Refer to figure 24.

CAUTION

To avoid affecting performance of the instrument, inspect the guide surface on the module and the corresponding seating area in the housing before installing the module base assembly. These surfaces must be free of dust, dirt, scratches, and contamination.

Ensure the gasket is in good condition. Do not reuse a damaged or worn gasket.

1. Ensure the gasket is aligned properly on the master module.

2. Connect the terminal box connector (key 51N) to the pwb assembly (key 50). Orientation of the connector is required.

3. Connect the potentiometer assembly connector (key 77E) to the pwb assembly (key 50). Orientation of the connector is required.

4. Insert the module base (key 2) into the housing (key 1).

5. Install four screws (key 38) in the master module into the housing. If not already installed, press four retaining rings (key 154) into the module base. Tighten the screws in an "X" pattern to 138 lbf•in (16 N•m) of torque.

6. Insert the cover hinge tabs into the module base. Swing the cover down into position and tighten the screw (key 41).

7. If not alr ady installed, screw the vent (key 52) into the vent connection on the back of the housing.

8. If not already installed, apply sealant (key 64) to the pipe plug (key 61) and install it in the output connection on the back of the housing.

9. For sliding-stem applications only, install the protective shield onto the side of the replacement module base assembly.

Submodules

The digital valve controller's master module contains the following submodules: I/P converter, pwb assembly, and pneumatic relay. If problems occur, these submodules may be removed from the master module and replaced with new submodules. After replacing a submodule, the master module may be put back into service.

Note

If the pwb assembly or I/P converter submodule is replaced, calibration and configuration of the Type DVC5000 Series digital valve controller will need to be redone to ensure that accuracy specifications are maintained. If any other submodule was replaced, recalibration or adjustment of the digital valve controller, master module, or submodules is not necessary.

Note

Exercise care when you perform maintenance on the master module. Reinstalling the cover will protect the I/P converter and gauges when other submodules are being serviced.

I/P Converter

Refer to figure 24 for location of key numbers.

The I/P converter (key 41) is located on the front of the master module.

Clearing the Primary Orifice

If the primary orifice becomes clogged, affecting performance, depress the cleanout plunger (see figure 16). This operation runs a wire through the orifice to clear the hole. Unscrew the single captive screw (key 43D) in the cover (key 43) and remove the cover from the digital valve controller to gain access to the cleanout plunger.

Manual Output Test

Refer to figure 16.

For direct-acting digital valve controllers:

To increase output pressure, gently depress the I/P armature.

T decrease output pressure, gently lift the I/P armature by lifting on the flapper mounting screw.

R moving the I/P Converter

1. Remove the front cover (key 43), if not already removed.

2. Remove the four socket-head screws (key 23) that attach the I/P converter to the module base.

3. Pull the I/P converter (key 41) straight out of the module base. Be careful not to damage the two electrical leads that come out of the base of the I/P converter.

4. Ensure that the two O-rings (key 39) stay in the module base and do not come out with the I/P converter.

Replacing the I/P Converter

1. Inspect the condition of the two O-rings (key 39) in the module base. Replace them, if necessary. Apply sealant (key 65) to the O-rings.

2. Install the I/P converter straight into the module base, taking care that the two electrical leads feed into the guides in the module base. These guides route the leads to the pwb assembly submodule.

3. Install four socket-head screws (key 23) and tighten them to 20.7 lbf•in (2 N•m) of torque.

PWB (Printed Wiring Board) Assembly

Refer to figure 24 for location of key numbers.

The pwb assembly (key 50) is located on the back of the module base assembly.

Disassembly

1. Remove the master module according to instructions in this manual.

2. Remove three screws (key 33).

3. Lift the pwb assembly straight out of the module base.

4. Ensure that the O-ring (key 40) is attached to the pressure sensor or sensor plug after the pwb assembly has been removed from the module base. If the O-ring remained in the module base, remove it and place it back on the pressure sensor or sensor plug.

Assembly and Mode Switch Configuration

1. Apply sealant (key 65) to the O-ring (key 40) and install it on the pressure sensor or sensor plug located on the pwb assembly (key 50).

Note

If the pwb assembly submodule is replaced, calibration and configuration of the Type DVC5000 Series digital valve controller will need to be redone to ensure that accuracy specifications are maintained.

2. Properly orient the pwb assembly as you install it into the module base. The two electrical leads from the I/P converter must guide into their receptacles in the pwb assembly and the pressure sensor or sensor plug on the pwb assembly must fit into its receptacle in the module base.

3. Push the pwb assembly into its cavity in the module base.

4. Install and tighten three screws (key 33) to 10.1 lbf•in (1 N•m) of torque.

5. Configure the DIP switches on the pwb assembly according to table 2.

Pneumatic Relay

Refer to figure 24 for location of key numbers.

The pneumatic relay (key 24) is located on the side of the master module.

Removing the Pneumatic Relay

1. Loosen the four screws (key 25) that attach the relay cap (key 26) to the module base. The screws are captive in the relay cap by O-rings (key 152).

2. Remove the relay cap. If there is resistance, use a flat-bladed screwdriver in the notch around the perimeter of the cap to pry it off.

Note

The Belleville spring (key 31) is captivated in the relay cap by a spring washer (key 32). The spring (key 30) is retained on the valve plug (key 29) by an interference fit on the inside diameter of the spring. The valve plug is captive internally in the relay by an O-ring on the valve plug. These parts may drop out as you remove the cap.

3. Use a flat-bladed screwdriver in the notch of the relay to pry the relay out of the module base.

CAUTION

Do not use excessive forc with the screwdriver when prying out the relay. The lip of the notch may break, which would not allow the O-ring to seal properly.

Replacing the Pneumatic Relay

1. Ensure the compartment in the module base that holds the relay is clean.

2. Visually inspect the 0.016-inch hole in the module base (the fixed bleed on the relay output) to ensure it is clean and free of obstructions. If cleaning is necessary, do not enlarge the hole.

3. Apply sealant (key 65) to three O-rings (key 27) and one additional O-ring (key 28) on the relay.

4. Insert the relay submodule into the module base. You will feel a slight resistance as the O-rings engage. No orientation of the relay is necessary.

5. Push on the relay until the O-rings are seated in their respective bores and the input diaphragm makes contact with the bottom of the bore. Take care not to damage the supply port during assembly.

6. If not already installed, attach the spring (key 30) and O-ring onto the valve plug (key 29), and insert the valve plug through the supply port of the relay.

7. Insert the four screws (key 25) through the cap. Install the O-rings (key 152) on the screws until the O-rings are inside the counterbored holes and not protruding past the surface of the cap.

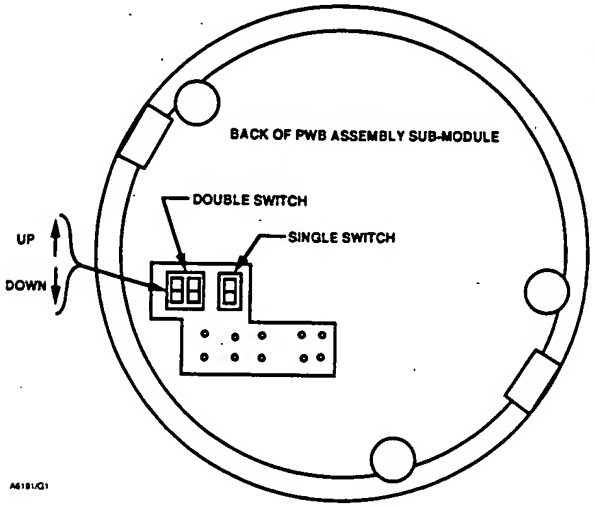
8. Place the Belleville spring (key 31) in the relay cap, with its inside diameter contacting the relay cap. Place the spring washer (key 32), with its three fingers pointing up, against the Belleville spring.

9. Install the relay cap on the module base. As the relay cap is installed, the spring washer fingers will grab the relay cap and retain the Belleville spring. Tighten the screws, in an "X" pattern, to 20.7 lbf•in (2 N•m) of torque.

Table 2. DIP Switch Configuration

DIP SWITCH FUNCTION	SWITCH	SWITCH POSITION
Multidrop Loop	Double	UP (1)
Point-to-Point Loop	Double	DOWN (2)
Auxiliary Terminal, Transmitter	Single	UP (3)
Auxiliary Terminal, Switch	Single	DOWN

1. Both switches on the "double switch" must be UP for multidrop loop.
2. Both switches on the "double switch" must be DOWN for point-to-point loop.
3. Auxiliary terminal, transmitter is available only with the Process PID option.



Gauges, Pipe Plugs, or Tire Valves

Refer to figure 24 for location of key numbers.

Depending on options ordered, the Type DVC5000 Series digital valve controller will be equipped with either two gauges (key 47), two pipe plugs (key 66), or two tire valves (key 67). These are located on the top of the master module next to the I/P converter.

Disassembly

1. Remove the front cover (key 43).

2. **For gauges (key 47),** use a wrench on the flats of the shaft underneath each gauge to remove the gauges from the module base.

For pipe plugs (key 66) and tir valves (key 67), use a wrench to remove these from the module base.

CAUTION

Do not connect the digital transducer directly to a voltage source when implementing the point-to-point wiring mode, or damage to the PWB assembly sub-module may result. In point-to-point wiring mode, the digital transducer may only be connected to a 4-20 ma current source.

Assembly

1. Apply sealant (key 64) to the threads of the gauges, pipe plugs, or tire valves.

2. Using a wrench, screw the gauges, pipe plugs, or tire valves into the module base. Orientation of the gauges is required.

Terminal Box

Refer to figure 24 for location of key numbers.

The terminal box is located on the housing and contains the terminal strip assembly for field wiring connections.

Disassembly

1. Loosen the set screw (key 58) in the cap (key 4) so that the cap can be unscrewed from the terminal box.

2. After removing the cap (key 4), note the location of field wiring connections and disconnect the field wiring from the terminal box.

3. Remove the master module, disconnecting the cable assembly from the terminal box assembly. This cable assembly attaches to the pwb assembly on the back of the master module.

4. Remove the screw (key 72). Unscrew the terminal box assembly from the housing.

5. Remove two wire retainers (key 44), internal and external to the terminal box.

Assembly

Note

All O-rings should be inspected for wear and replaced as necessary.

1. Install two wire retainers (key 44), internal and external to the terminal box.

2. Apply sealant (key 65) to the O-ring (key 36) and install the O-ring over the 2-5/16 inch thread on the terminal box. Use of a tool is recommended to prevent cutting the O-ring while installing it over the threads.

3. Apply lubricant (key 63) to the 2-5/8 inch threads on the terminal box to prevent seizing or galling when the cap is installed.

4. Screw the cap (key 4) onto the terminal box.

5. Install a set screw (key 58) into the cap (key 4). Loosen the cap (not more than 1 turn) to align the set screw over a slot in the terminal box. Tighten the set screw (key 58).

6. Apply sealant (key 65) to the O-ring (key 35) and install the O-ring over the 15/16 inch thread on the terminal box. Use of a tool is recommended to prevent cutting of the O-ring while installing it over the threads.

7. Apply sealant (key 64) to the 15/16 inch thread on the terminal box to prevent seizing or galling when the terminal box assembly is installed onto the housing.

8. Screw the terminal box assembly onto the housing until it bottoms out. Back off the terminal box assembly a maximum of 1-1/4 turns for proper orientation of the terminal box to the housing. Install the screw (key 72) to prevent the terminal box assembly from rotating.

9. Apply sealant (key 64) to the conduit entrance plug (key 62) and install it into the desired side of the terminal box.

Potentiometer Assembly for Type DVC5010 and DVC5020

Disassembly

For the Type DVC5010 Sliding-Stem Digital Valve Controller:

1. Loosen the screw (key 80) that secures the feedback arm to the potentiometer shaft.

2. Remove the feedback arm (key 79) from the potentiometer shaft.

3. Proceed to step 10.

For th Type DVC5020 Rotary Digital Valve Controller:

4. Remove the bias spring (key 93).

5. Remove the E-ring (key 85) and washer (key 86) that are next to the inboard flange bearing (key 83).

6. Pull the feedback arm (key 84) straight out of the housing, disengaging the pin of the arm assembly from the slot in the feedback arm.

7. Loosen the screw (key 80) that secures the arm assembly to the potentiometer shaft.

8. Remove the arm assembly (key 91) from the potentiometer assembly (key 77) shaft.

9. Proceed to step 10.

For both Type DVC5010 and DVC5020:

10. The pwb assembly must be unplugged from the potentiometer cable and removed from the housing.

11. The potentiometer assembly (key 77) is joined to the bushing (key 73) with thread lock (key 121), therefore the two components must be removed as one unit.

12. Loosen the set screw (key 58) that locks the bushing against the housing.

13. Unscrew the bushing/potentiometer assembly from the housing.

Assembly

Note

When installing the potentiometer/bushing, take care to not wind up the wires inside the housing. This can damage the soldered connections.

For both Type DVC5010 and DVC5020:

1. Apply lubricant (key 63) to the bushing threads.

2. Insert the bushing into the housing. Reach inside the housing and take hold of the wires attached to the connector.

3. Start threading the bushing into the housing, simultaneously turning the wires to prevent them from winding up inside the housing. This will reduce potential damage to the soldered connections.

4. Tighten the bushing against the housing and tighten the set screw (key 58) to lock the bushing.

5. For Type DVC5010, go to step 6. For Type DVC5020, go to step 9.

For the Type DVC5010 Sliding-Stem Digital Valve Controller:

6. Loosely assemble the bias spring (key 82), screw (key 80), and nut (key 81) to the feedback arm (key 79), if not already installed.

7. Attach the feedback arm (key 79) to the pot ntiometer shaft. Align the fe dback arm (key 79) to the housing (key 1) by inserting the alignment pin (key 82) through the **hole** marked **"A"** on the feedback arm. Fully engage the alignment pin into the tapped hole in the side of the housing (key 1). Adjust the potentiomet r shaft to obtain a measured potentiometer resistance of 1950 to 2050 ohms between pins 2 and 3 of the potentiometer. Refer to figure 17.

8. Tighten the screw (key 80) to secure the feedback arm to the potentiometer shaft. Paint the screw to discourage tampering with the connection.

For the Type DVC5020 Rotary Digital Valve Controller:

9. Loosely assemble the screw (key 80) and nut (key 81) to the arm assembly (key 91), if not already installed.

10. Attach the arm assembly (key 91) to the potentiometer assembly (key 77) shaft. Hold the arm assembly (key 91) (pointed toward the terminal box) in a fixed position parallel to the back plane of the housing (key 1). Adjust the potentiometer shaft to obtain a measured potentiometer resistance of 6250 to 6350 ohms between pins 2 and 3 of the potentiometer. Refer to figure 17.

11. Tighten the screw (key 80) to secur the arm assembly to the potentiometer shaft. Paint the screw to discourag tampering with the connection.

12. Apply lubricant (key 63) to the pin portion of the arm assembly (key 91).

13. Push the feedback arm (key 84) into the housing, engaging the pin of the arm assembly into the slot in the feedback arm.

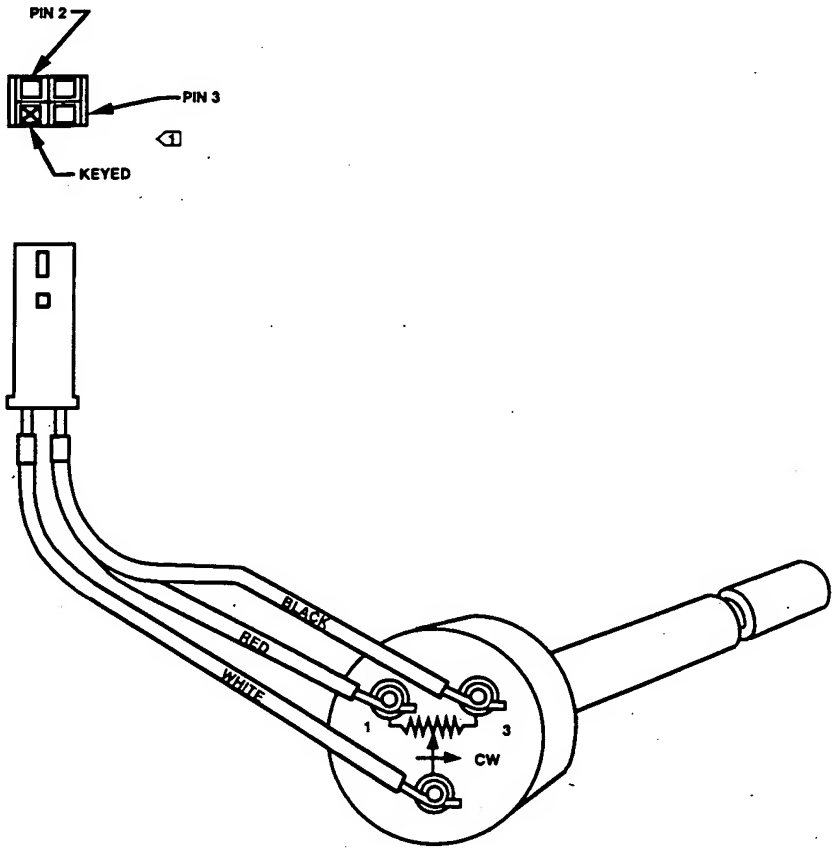
14. Install the washer (key 86) and E-ring (key 85) next to the inboard flange bearing (key 83).

15. Install the bias spring (key 93).

Communication

The HART (Highway Addressable Remote Transducer) protocol gives field devices the capability of communicating instrument and process data digitally. This digital communication occurs over the same two-wire loop that provides the 4-20 mA process control signal, without disrupting the process signal. In this way, the analog process signal, with its faster update rate, can be used for control. At the same time, the HART protocol allows access to digital diagnostic, maintenance, and additional process data.

The protocol provides total system integration via a host device.



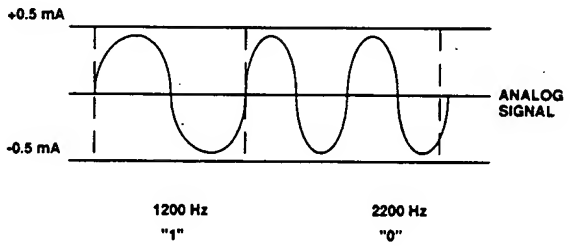
1 THE POTENTIOMETER RESISTANCE BETWEEN PINS 2 AND 3 CAN BE MEASURED AT THE CONNECTOR. INSERT TWO SHORT LENGTHS OF 22 AWG WIRE INTO THE PIN 2 AND 3 RECEPTACLES IN THE CONNECTOR. CLIP ON LEADS FROM A DVM (DIGITAL VOLTMETER) TO MEASURE THE RESISTANCE.

A6481/G1

Figure 17. Potentiometer Resistance Measurement

The HART protocol uses the frequency shift keying (FSK) technique based on the Bell 202 communication standard. By superimposing a frequency signal over the 4-20 mA current, digital communication is attained. Two individual frequencies of 1200 and 2200 Hz are superimposed as a sinewave over the 4-20 mA current loop. These frequencies represent the digits 1 and 0 (see figure 18). The average value of this sinewave is zero, therefore no dc value is added to the 4-20 mA signal. Thus, true simultaneous communication is achieved without interrupting the process signal.

The HART protocol allows the capability of multidropping, networking several devices to a single communications line, as shown in figure 19. This process is well suited for monitoring remote applications such as pipelines, custody transfer sites, and tank farms. See table 2 for instructions on changing the mode switch configuration to multidrop.



AVERAGE CURRENT DURING COMMUNICATION = ANALOG SIGNAL

A6174-1/G1

Figure 18. HART® Frequency Shift Keying Technique

Wiring Practic s

C ntrol System Requirements

There are several parameters that should be checked to ensure the control system is compatible with the Type DVC5000 Series digital valve controller.

Available System Voltage

The available voltage for the Type DVC5000 digital valve controller must be at least 12 volts dc. Calculate this with the following formula.

Available voltage = [Compliance Voltage (at maximum current)] – [2 volts (if a HART filter is used)] – [total cable resistance × maximum current]. Calculated available voltage should be greater than or equal to 12 volts dc.

For example:

Available voltage = [19.5 volts (at 22.25 mA)] – [2 volts] – [100 ohms × 0.02225 amps]

Available voltage = [19.5] – [2] – [2.225]

Available voltage = 15.275 volts

Note

The terminal voltage measured at the "LOOP +" and "LOOP –" terminals should be between 10 and 11.5 Vdc.

Compliance Voltage

If the compliance voltage of the control system is not known, perform the following compliance voltage test. Refer to figure 20.

1. Set the controller to the maximum output current.

2. Increase the resistance of the 1 kilohm potentiometer, shown in figure 20, until the current observed on the milliammeter begins to drop quickly.

3. Record the voltage shown on the voltmeter. This is the compliance voltage of the control system.

Refer to *FIELDVUE Wiring Practices — PS Sheet 62.1:FIELDVUE(A)* or contact your Fisher Controls sales representative or sales office for specific parameter information relating to your control system.

Maximum Cable Capacitance

Maximum cable length limits due to cable capacitance can be calculated using the following formula.

$Length(ft) = [160{,}000 - C_{master}(pF)] \div [C_{cable}(pF/ft)]$

where C_{master} = the capacitance of the control system used

C_{cable} = the capacitance of the cable used

Note the following example where the capacitance of the control system used is 50,000pF and the capacitance of the cable used is 60pF/ft.

$Length(ft) = [160{,}000 - 50{,}000pF] \div [60pF/ft]$

Length = 1833 ft.

If the capacitance of the wire is too high, maximum cable length will be limited. To increase cable length, select a wire with lower capacitance per foot. Refer to *FIELDVUE Wiring Practices — PS Sheet 62.1:FIELDVUE(A)* or contact your Fisher Controls sales representative or sales office for specific information relating to your control system.

HART Filter Use and Specifications

Depending on the control system being used, a filter may be needed to allow HART communications to work properly. The HART filter is an active device that is inserted in line with both wires of the HART 4-20 mA output loop. Its purpose is to effectively isolate the controller output from modulated HART communication signals. The filter receives a 4-20 mA current signal from the controller, and drives the loop as a high impedance current source; the output current is a filtered replica of the input current. The current drive stage of the filter prevents the voltage modulation in the HART loop from being seen by, or having an effect on, the controller output. To perform the intended function, the filter requires a small amount of operating current (less that 60 microamps) and input to output head voltage of up to 2 Vdc.

The filter will normally be installed near the field wiring terminals of the controller or control system I/O (see figure 21). HART communications will only be possible between the filter and the field instrument, not on the controller side of the filter. The filter is not designed or intended for use in the process environment.

Refer to separate *Type HF100 FIELDVUE HART Filter — Form 5340* instruction manual for installation, calibration, and maintenance of the HART filter.

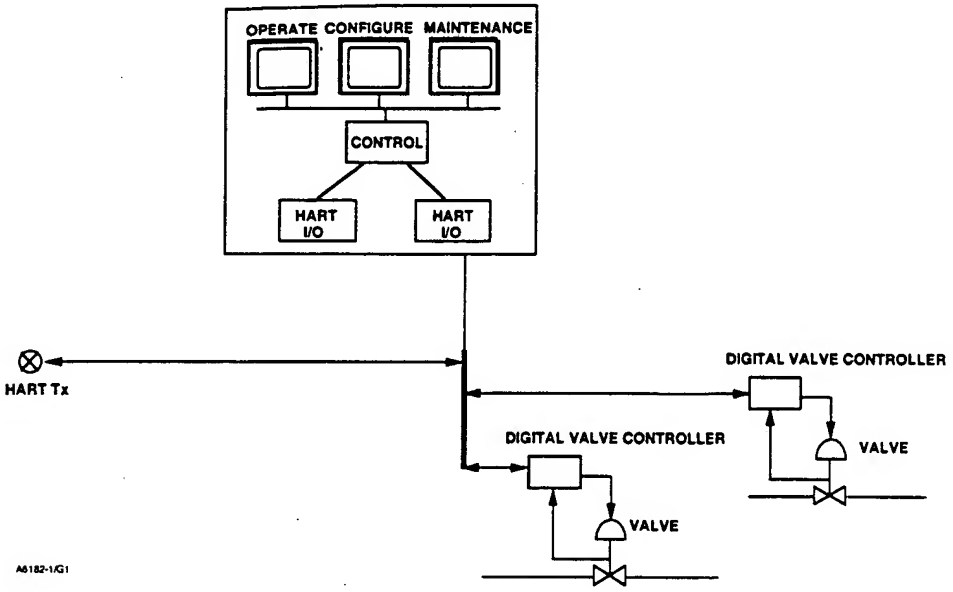
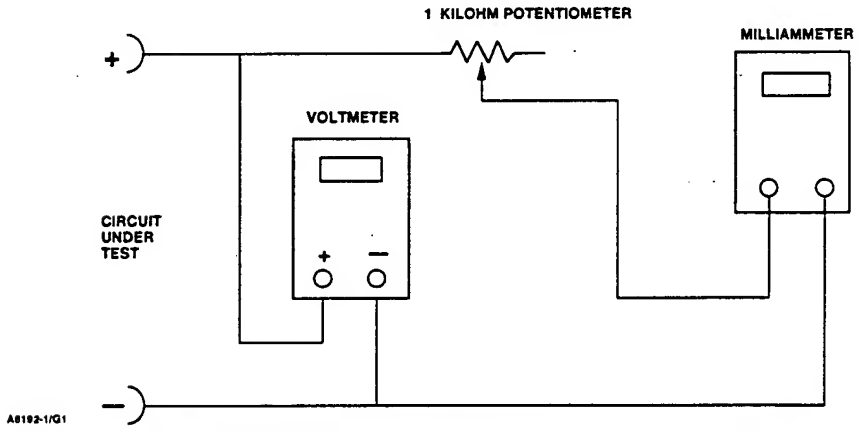


Figure 19. Local Control Multidrop



WARNING

Personal injury or property damage caused by fire or explosion may occur if this test is attempted in an area which contains a potentially explosive atmosphere or has been classified as hazardous.

Figure 20. Voltage Test Schematic

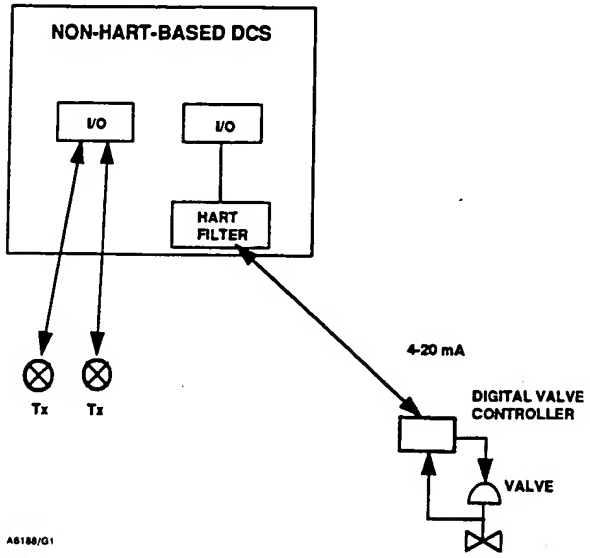


Figure 21. HART Filter

Figure 22. Type DVC5020 Digital Valve Controller with Handheld Communicator

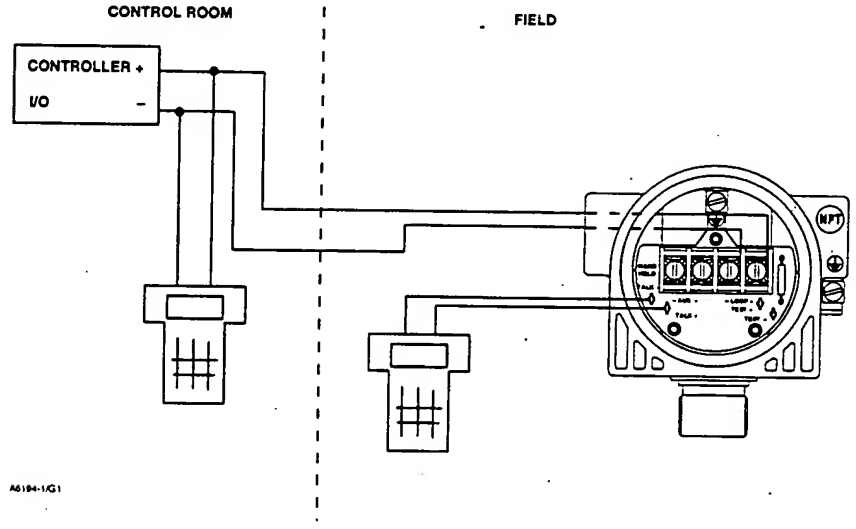


Figure 23. Connecting a Handheld Communicator at the FIELDVUE Instrument or in the I/O Rack

Handheld Communicator Use

The handheld communicator interfaces with the Type DVC5000 Series digital valve controller from any wiring termination point in the 4-20 mA loop. If the handheld communicator is connected directly to the Type DVC5000 Series digital valve controller, attach the clip-on wires provided with the handheld communicator to the terminals marked TALK. These terminals are located in the Type DVC5000 Series digital valve controller terminal box. See figures 22 and 23.

Refer to the instructions supplied with the handheld communicator for information regarding its use. Refer to the separate *FIELDVUE Instrument Communications Manual - Form 5345* for information on menus available for this application.

Calibration

Refer to the separate *FIELDVUE Instrument Communications Manual - Form 5345* for information on calibration of the DVC5000 Series digital valve controller.

Instrument Troubleshooting

WARNING

Personal injury or property damage caused by fire or explosion may occur if this test is attempted in an area which contains a potentially explosive atmosphere or has been classified as hazardous.

If communication or output difficulties are experienced with the instrument, refer to the troubleshooting chart shown in table 3.

If the Available Voltage Test needs to be performed, follow these instructions. Refer to figure 20.

1. Set the controller to the maximum output current.

2. Set the resistance of the 1 kilohm potentiometer, shown in figure 20, to zero.

3. Record the current shown on the milliammeter.

4. Adjust the resistance of the 1 kilohm potentiometer until the voltage read on the voltmeter is 12.0 volts.

5. Record the current shown on the milliammeter.

6. If the current recorded in step 5 is the same as that recorded in step 3 (± 0.08 mA), the available voltage is adequate.

7. If the available is inadequate, refer to the *Wiring Practices* section of this manual.

If the Compliance Voltage Test needs to be performed, refer to the instructions in the *Control System Parameters* section of this manual.

Table 3. Instrument Troubleshooting

Symptom	Possible Cause	Action
1. Communication from the control room I/O rack is unsuccessful.	1a. Insufficient available Voltage.	1a. **Point-to-Point**—Perform Available Voltage test for point-to-point mode. Measured available voltage ≥ 12 volts. **Multidrop**—Measure the terminal voltage for multidrop mode. Terminal voltage ≥ 12 volts.
	1b. Process Loop Output Impedance too low.	1b. Install HART filter after reviewing terminal voltage requirements.
	1c. Cable capacitance too high.	1c. Review maximum cable capacitance limits.
	1d. HART filter misadjusted.	1d. Check filter adjustment.
	1e. Improper field wiring.	1e. Check polarity of wiring and integrity of connections. Make sure cable shield is grounded only at controller end.
	1f. Process Loop providing less than 4 mA to loop.	1f. Check controller output settings.
	1g. PWB configured improperly.	1g. Check PWB configuration DIP switches.
	1h. PWB failure.	1h. Check instrument communication by disconnecting from the loop and powering with an independent 4-20 mA current source.
2. Incorrect Output Pressure	2a. Insufficient supply pressure.	2a. Check air supply system and instrument regulator.
	2b. Primary orifice plugged.	2b. Depress cleanout wire to reestablish output.
	2c. Pneumatic relay failure.	2c. Depress (or lift) I/P converter armature. Output will rise (or fall) if pneumatic relay is operating.
	2d. I/P converter failure.	2d. Remove I/P converter and check coil resistance (1000 to 2000 ohms).
	2e. Insufficient available voltage.	2e. **Point-to-Point**—Perform Available Voltage test for point-to-point mode. Measured available voltage ≥ 12 volts. **Multidrop**—Measure the terminal voltage for multidrop mode. Terminal voltage ≥ 12 volts.
	2f. Improper field wiring.	2f. Check polarity and integrity of connections.
	2g. Disconnected terminal box connector.	2g. Remove module base and reinstall the terminal box connector.
	2h. Potentiometer disconnected.	2h. Remove module base and reinstall the potentiometer assembly connector.
	2i. Feedback linkage failure.	2i. Check feedback linkage for proper operation.
	2j. Potentiometer failure.	2j. Check instrument status using handheld communicator.
	2k. Improper configuration.	2k. Check configuration using handheld communicator.
	2l. Improper calibration.	2l. Check calibration using handheld communicator.
	2m. PWB assembly failure.	2m. Replace PWB assembly.
3. Valve or actuator cycles (oscillates).	3a. DVC gain is set too high.	3a. Change Tuning Set with handheld communicator or ValveLink software.

Parts Kits

Key	Description	Part Number
1*	Elastomer Spare Parts Kit	14B5072X012
2*	Relay Spare Parts Kit	14B5072X022
3*	Small Hardware Spare Parts Kit	14B5072X032
6	657, 667, 513, 513R Mounting Kit	14B5072X062
7	1051, 1052 Mounting Kit (see Note)	14B5072X072
8	1250, 1250R Mounting Kit	14B5072X082
9	DVC5010 Alignment Pin Kit	14B5072X092

Note

Key 7 parts kit (1051, 1052 Mounting Kit) contains a vent-away mounting bracket. Install a 1/4-inch NPT socket head pipe plug in the tapped hole in the side of the mounting bracket if Type DVC5020 is not for vent-away construction.

Parts List

Parts which do not show part numbers are not orderable.

Footnote numbers shown after key numbers correspond to the Parts Kits key numbers. Also see footnote information at the bottom of this page.

Common Parts

Key	Description	Part Number
1	Housing, aluminum	
23(3)	Cap Screw, Hex Socket (4 req'd)	
33(3)	Mach Screw, Pan Hd (3 req'd)	
34(1)	O-Ring (2 req'd)	
36(1)	O-Ring	
38(3)	Cap Screw, Hex Socket (4 req'd)	
39(1)	O-Ring (2 req'd)	
40(1)	O-Ring	
42(1)	Gasket	
43	Cover Assembly	34B0612X012
48	Nameplate	
49(3)	Drive Screw (4 req'd)	
52(3)	Vent	
61	Pipe Plug, Hex Socket	
62	Pipe Plug, Hex Hd	
63	Lubricant, Grease	
64	Sealant, Anti-Seize Not furnished with instrument. Use Zink-Plate No. 770 Anti-Seize Compound or equivalent.	
65	Sealant, Silicone	
74(7)	Mounting Bracket DVC5020 only	
75(1,7)	O-Ring DVC5020 Vent-away only	
128	Pipe Plug DVC5020 Vent-away only	

I/P Assembly

41*	I/P Assembly	34B0563X012

Module Base

	Master Module Assembly	14B5071X012
2	Module Base Assembly	34B3169X012
41	I/P Assembly	
23	Cap Screw, (4 req'd)	
39	O-Ring, (2 req'd)	
24	Relay Module	
25	Machine Screw, (4 req'd)	
26	Cap	
31	Belleville Spring	
32	Spring Washer	
152	O-Ring, (4 req'd)	
66	Pipe Plug, (2 req'd)	
40	O-Ring	
33	Machine Screw, (3 req'd)	

Terminal Box

3	Terminal Box, aluminum	
4	Cap, Terminal Box	34B0567X012
44(3)	Wire Retainer (2 req'd)	
58(3)	Set Screw, Hex Socket	
72(3)	Cap Screw, Hex Socket	
164	Terminal Box Assembly	34B8237X012

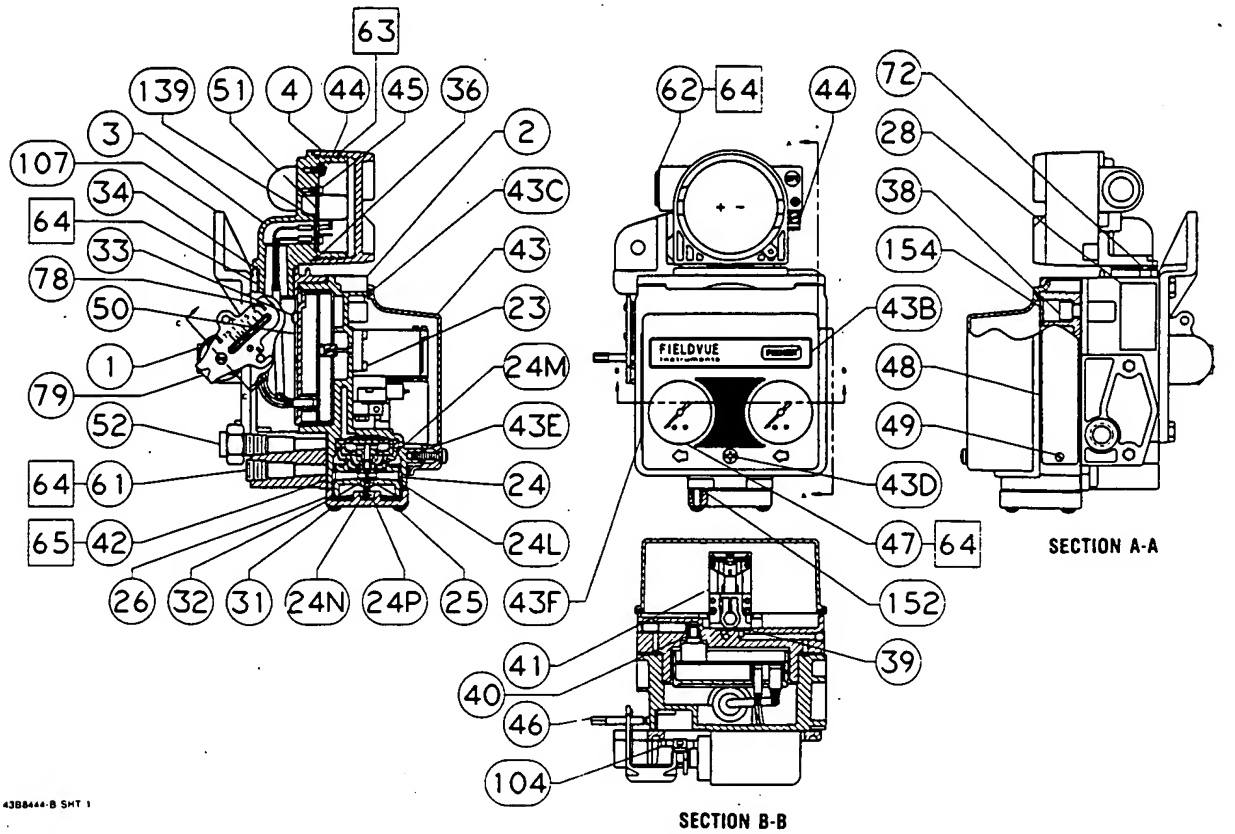
Relay

24(2)	Relay Module	
24N(2)	Valve Plug	
24P(2)	Spring	
25(2)	Mach Screw, Pan Hd (4 req'd)	
26	Cap	34B0583X022
31(2)	Belleville Spring	
32(2)	Washer	

PWB Assembly

50*	PWB Assembly	
	Standard	34B0622X082
	w/ Advanced Diagnostics	34B0621X152

* Recommended spare
1. Available in the Elastomer Spare Parts Kit
2. Available in the Relay Spare Parts Kit.
3. Available in the Small Hardware Spare Parts Kit
7. Available in the 1051, 1052 Mounting Kit



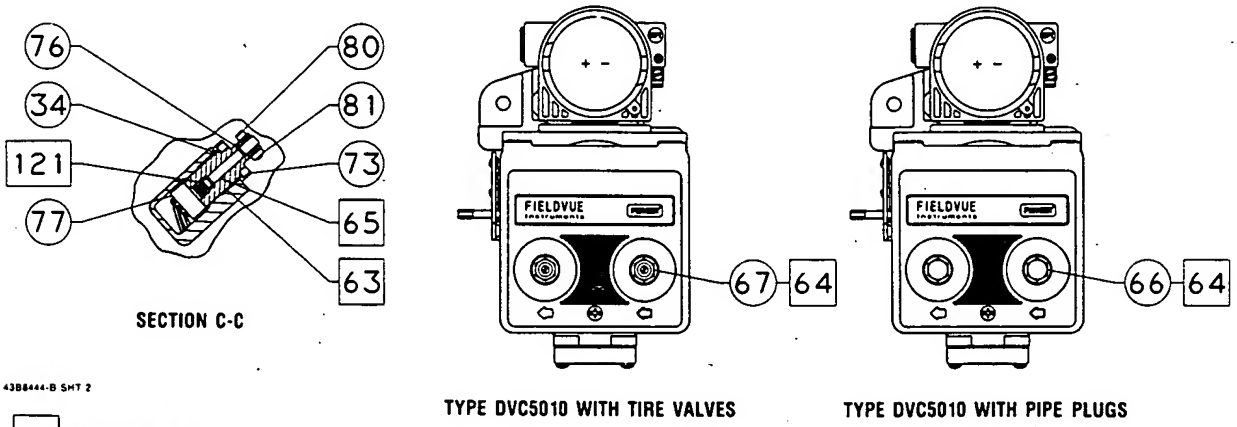


Figure 24. Type DVC5010 Series Digital Valve Controller Assembly

Key	Description	Part Number

Pressure Gauges, Pipe Plugs, or Tire Valve Assys

47	Pressure Gauge (2 req'd)	
	PSI/MPA/BAR Gauge Scale	
	Plastic Case, Brass Connection	
	To 25 PSI, 170 kPa, 1.7 bar	11B4040X012
	To 50 PSI, 345 kPa, 3.4 bar	11B4040X022
	To 100 PSI, 690 kPa, 6.9 bar	11B4040X032
	SST Case, SST Connection	
	To 25 PSI, 170 kPa, 1.7 bar	11B4039X012
	To 50 PSI, 345 kPa, 3.4 bar	11B4039X022
	To 100 PSI, 690 kPa, 6.9 bar	11B4039X032
	PSI/KG/CM2 Gauge Scale	
	Plastic Case, Brass Connection	
	To 25 PSI, 1.8 kg/cm2	11B4040X042
	To 50 PSI, 3.5 kg/cm2	11B4040X052
	To 100 PSI, 7.0 kg/cm2	11B4040X062
66	Pipe Plug, Hex Hd (2 req'd)	
67	Tire Valve Assembly, steel pl (2 req'd)	

F edback Parts

46(9)	Alignment Pin, DVC5010 only	14B0656X022
76(1)	O-Ring (2 req'd)	
	Potentiometer and Bushing Assy	14B5070X012
77*	Potentiometer Assy	34B0604X022
73	Bushing	
76	O-ring	
	Thread Lock	
	Silicon Sealant	
78(3)	Bias Spring, DVC5010 only	
79(6)	Feedback Arm	
	DVC5010 only	
	For 513, 513R, 657/30-100, and 667/30-100	
	For 1250/all sizes and 1250R/all sizes	
80(3)	Cap Screw, Hex Socket	
81(3)	Square Nut	
82(3)	Bias Spring, DVC5020 only	
83(7)	Flange Bearing, DVC5020 only (2 req'd)	
84(7)	Feedback Arm Assy	
	DVC5020 only	
	For 1051/40-60 and 1052/40-70	
	For 1051/33 and 1052/20, 33	
85(3)	E Ring, DVC5020 only (2 req'd)	
86(7)	Plain Washer, DVC5020 only (2 req'd)	
87(7)	Follower Post, DVC5020 only	
88(7)	Roller, DVC5020 only	
89(7)	Lock Washer, Spring, DVC5020 only	
90(7)	Hex Nut, Mach Screw, DVC5020 only	
91(7)	Arm Assy, DVC5020 only	
92(7)	Cap Screw, Hex Socket	
	DVC5020 only (4 req'd)	
93(7)	Torsion Spring, Feedback Arm, DVC5020 only	
121	Thread Lock	
163	Plain Washer	

Key	Description	Part Number

Mounting Parts

Type DVC5010

	For Types 657 & 667, size 30-60 actuators	
102	Shield	34B1428X012
103(3,6)	Mach Screw, Pan Head (2 req'd)	
104(6)	Cap Screw, Hex Head (4 req'd)	
105(6)	Screw, Hex Flg (2 req'd)	
106(6)	Adjustment Arm	
107(6)	Mounting Bracket	
108(6)	Connector Arm	
109(6)	Mach Screw, Hex Head	
110(6)	Lock Washer, Ext	
	For Types 657 & 667, size 70-100 actuators	
97(6)	Feedback Arm Ext	
98(6)	Mach Screw, Hex Head	
99(6)	Mach Screw, Flat Head	
100(6)	Hex Nut (2 req'd)	
101(6)	Spacer	
102	Shield	44B1429X012
103(3,6)	Mach Screw, Pan Head (2 req'd)	
104(6)	Cap Screw, Hex Head (4 req'd)	
105(6)	Screw, Hex Flg (2 req'd)	
106(6)	Adjustment Arm	
107(6)	Mounting Bracket	
108(6)	Connector Arm	
109(6)	Mach Screw, Hex Head	
110(6)	Lock Washer, Ext	
126(6)	Plain Washer	
	For Types 513 and 513R, size 20 actuators	
102	Shield	34B1428X012
103(3,6)	Mach Screw, Pan Head (2 req'd)	
104(6)	Cap Screw, Hex Head (4 req'd)	
155(6)	Cap Screw, Hex Head (2 req'd)	
106(6)	Adjustment Arm	
107(6)	Mounting Bracket	
108(6)	Connector Arm	
109(6)	Mach Screw, Hex Head	
110(6)	Lock Washer, Ext	
118(6)	Spacer (2 req'd)	
122(6)	Plain Washer (2 req'd)	
126(6)	Plain Washer	
	For Types 513 and 513R, size 32 actuators	
102	Shield	34B1428X012
103(3,6)	Mach Screw, Pan Head (2 req'd)	
104(6)	Cap Screw, Hex Head (4 req'd)	
155(6)	Cap Screw, Hex Head (2 req'd)	
106(6)	Adjustment Arm	
107(6)	Mounting Bracket	
108(6)	Connector Arm	
109(6)	Mach Screw, Hex Head	
110(6)	Lock Washer, Ext	
118(6)	Spacer (2 req'd)	
119(6)	Spacer (2 req'd)	
120(6)	Cap Screw, Hex Head (2 req'd)	
122(6)	Plain Washer (2 req'd)	
126(6)	Plain Washer	

* Recommended spare
1. Available in the Elastomer Spare Parts Kit
3. Available in the Small Hardware Spare Parts Kit
6. Available in the 657, 667, 513, 513R Mounting Kit
7. Available in the 1051, 1052 Mounting Kit
9. Available in the DVC5010 Alignment Pin Kit

Key	Description	Part Number
	For Types 1250 & 1250R actuators,all sizes	
102	Shield	34B1428X012
103(3,8)	Mach Screw, Pan Head (2 req'd)	
104(8)	Cap Screw, Hex Head (4 req'd)	
106(8)	Adjustment Arm	
107(8)	Mounting Bracket	
108(8)	Connector Arm	
109(8)	Mach Screw, Hex Head	
110(8)	Lock Washer, Ext	
111(8)	Brace	
112(8)	Cap Screw, Hex Head (2 req'd)	
113(8)	Cap Screw, Hex Head (2 req'd)	
114(8)	U-Bolt (3 req'd)	
115(8)	Hex Nut (8 req'd)	
123(8)	Plain Washer (3 req'd)	
124(8)	Plain Washer (2 req'd)	
125(8)	Cap Screw, Hex Head	
126(8)	Plain Washer	
	Type DVC5020	
	For Types 1051, size 40-60 and Type 1052, size 40-70 actuators	
116(7)	Cap Screw, Hex Socket (4 req'd)	
	For Type 1051, size 33 and Type 1052, size 20 & 33 actuators	
116(7)	Cap Screw, Hex Socket (8 req'd)	
117(7)	Mounting Adaptor	

Cam

	For DVC5020 only	
	For Type 1051, size 40-60 and 1052, size 40-70 actuators	
94(7)	Cam	
95(7)	Mach Screw, Hex Head (2 req'd)	
	For Type 1052, size 20 actuators	
94(7)	Cam	
95(7)	Mach Screw, Hex Head (2 req'd)	
	For Type 1051 & 1052, size 33 actuators	
94(7)	Cam	
95(7)	Mach Screw, Hex Head (2 req'd)	

Filter Regulator Mounting Parts

For use only when filter regulator is specified.

	For Integral Mounting	
59	Cap Screw, Hex Hd, 2 req'd	1C398824052
60*	O-Ring	1E591406992
61	Pipe Plug, Hex Socket	1C333528992
	For Casing Mounting	
61	Pipe Plug, Hex Socket	1C333528992
69	Hex Nut, 2 req'd	1A352724122
70	Cap Screw, Hex Hd, 2 req'd	1C197024052
71	Mounting Bracket	1F401225072
	For Yoke Mounting	
59	Cap Screw, Hex Hd, 2 req'd	1C398824052
61	Pipe Plug, Hex Socket	1C333528992
	For Wall Mounting	
161	Pipe Nipple	1C678926232
	For Universal Mounting	
59	Cap Screw, Hex Hd, 2 req'd	1C398824052
60*	O-Ring	1E591406992
61	Pipe Plug, Hex Socket	1C333528992
69	Hex Nut, 2 req'd	1A352724122
70	Cap Screw, Hex Hd, 2 req'd	1C197024052
71	Mounting Bracket	1F401225072
161	Pipe Nipple	1C678926232

HART Filter

37	HART Filter	14B1934X012

* Recommended spare
3. Available in the Small Hardware Spare Parts Kit
7. Available in the 1051, 1052 Mounting Kit
8. Available in the 1250, 1250R Mounting Kit

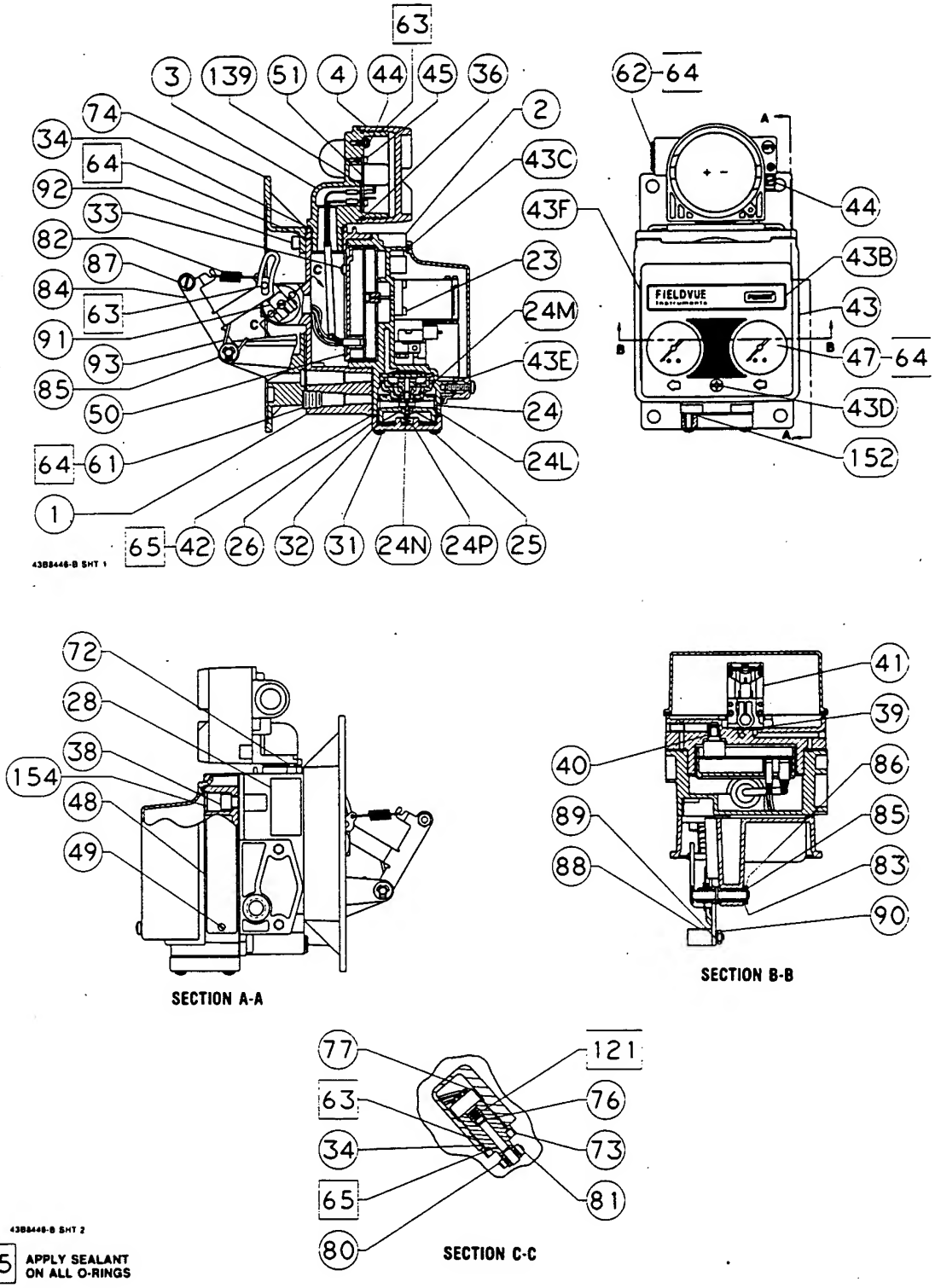


Figure 25. Type DVC5020 Series Digital Valve Controller Assembly

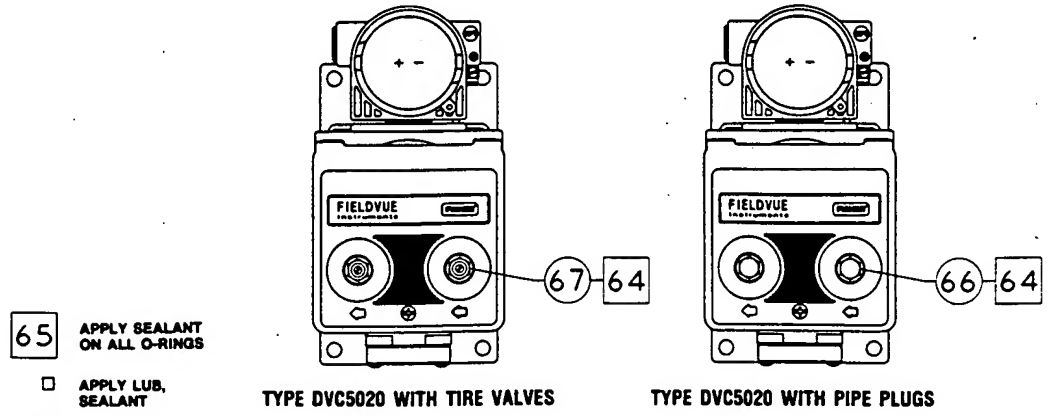


Figure 25. Type DVC5020 Series Digital Valve Controller Assembly (Continued)

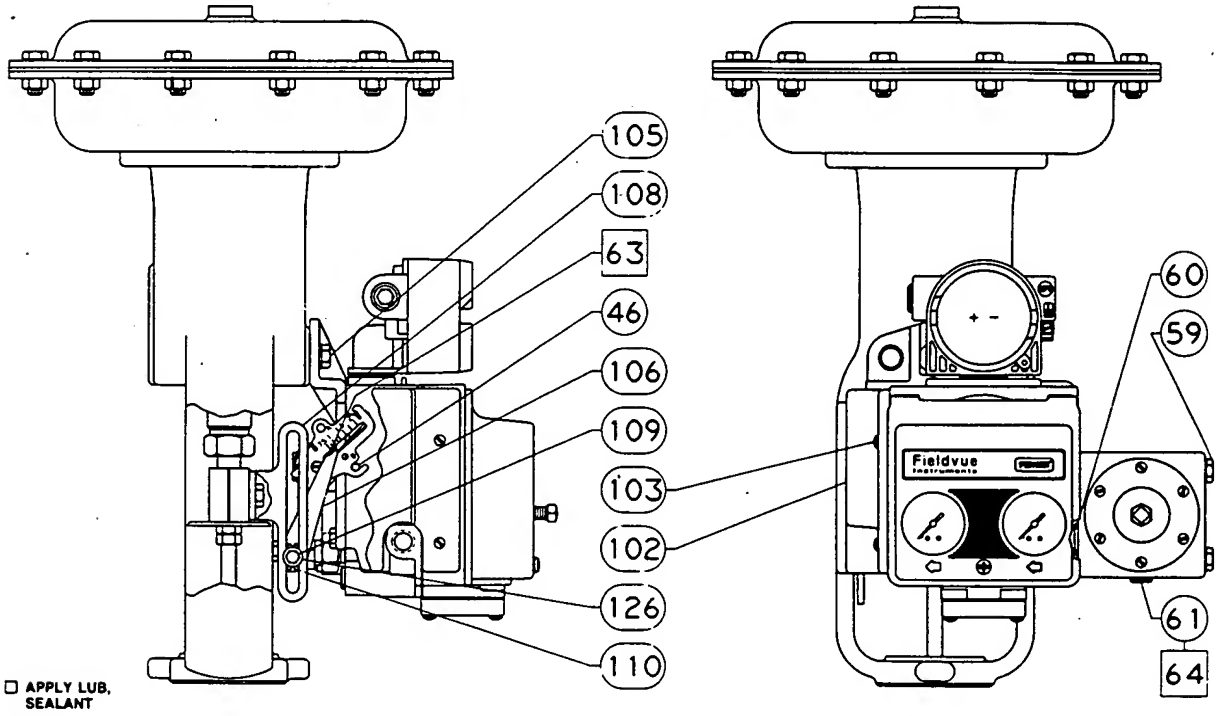


Figure 26. Type DVC5010 Series Digital Valve Controller Mounted on Type 657/667 Size 30-60 Actuator with Integrally Mounted Filter Regulator

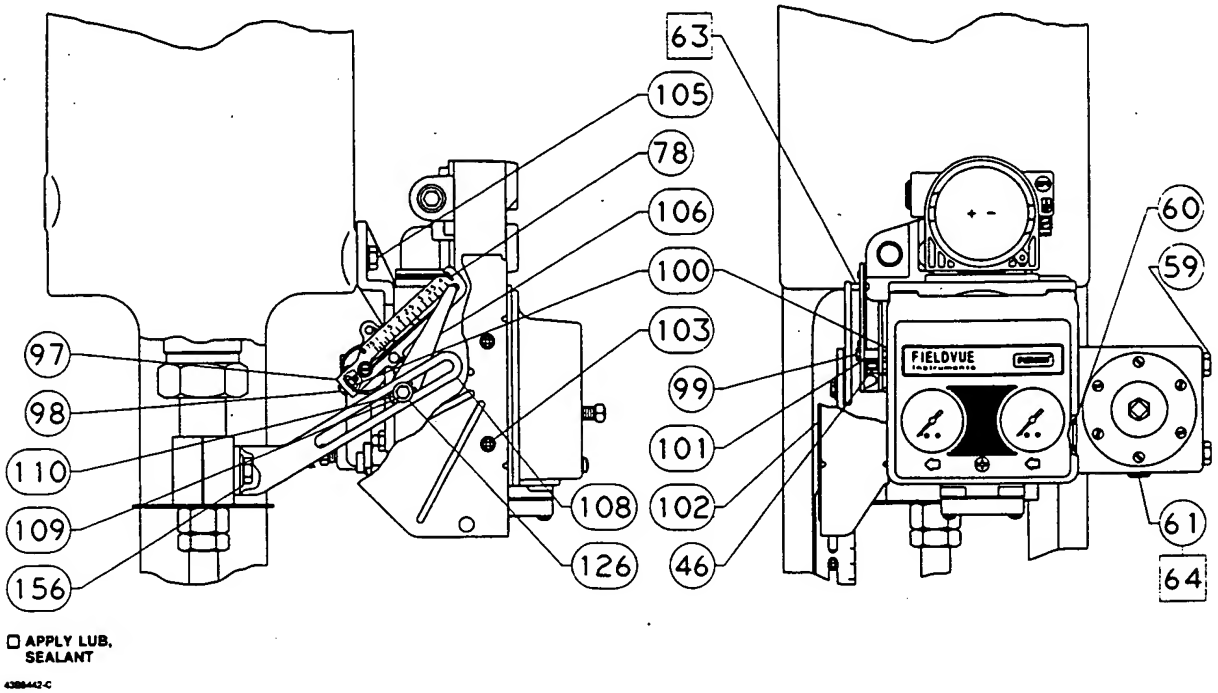


Figure 27. Type DVC5010 Series Digital Valve Controller mounted on Type 657/667 Size 70-100 Actuator with Integrally Mounted Filter Regulator

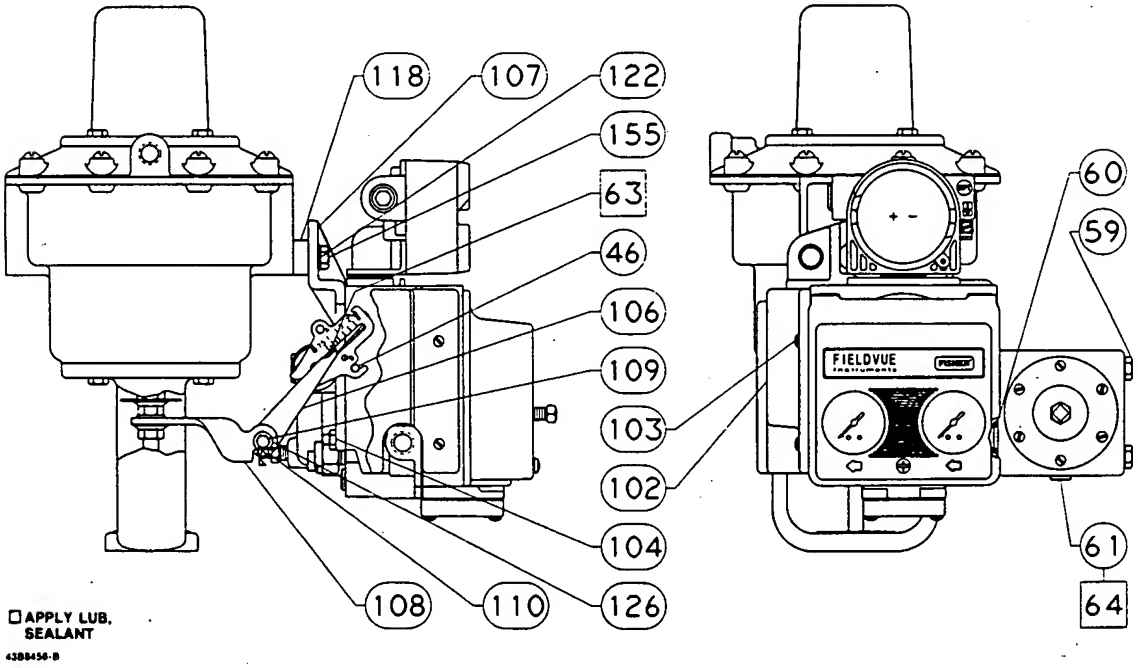


Figure 28. Type DVC5010 Series Digital Valve Controller Mounted on Type 513 Size 20 Actuator with Integrally Mounted Filter Regulator

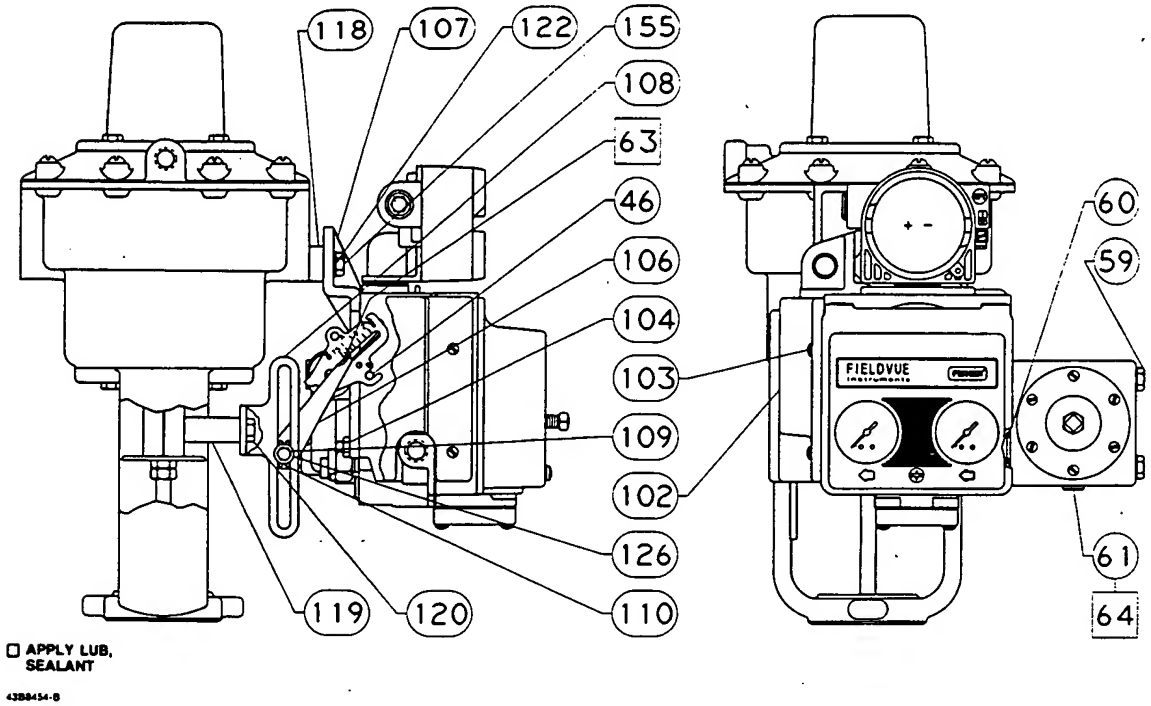


Figure 29. Type DVC5010 Series Digital Valve Controller Mounted on Type 513 Size 32 Actuator with Integrally Mounted Filter Regulator

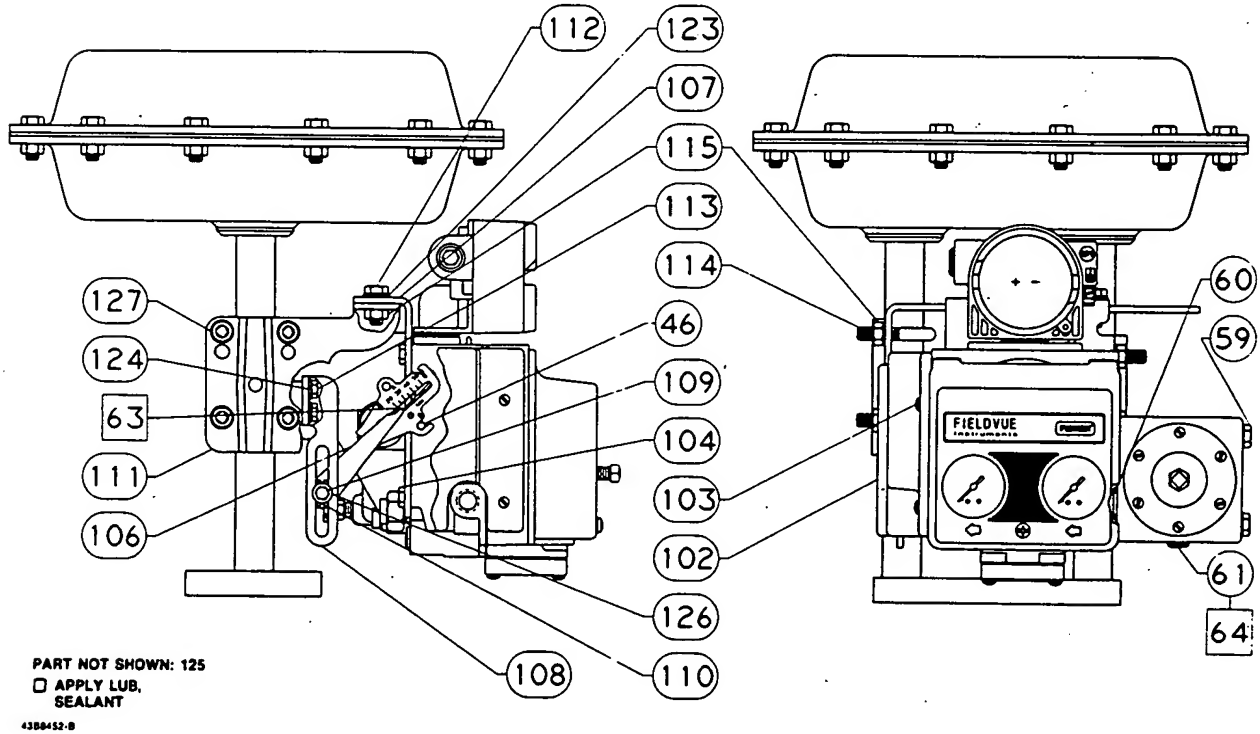


Figure 30. Type DVC5010 Series Digital Valve Controller Mounted on Type 1250 Actuator with Integrally Mounted Filter Regulator

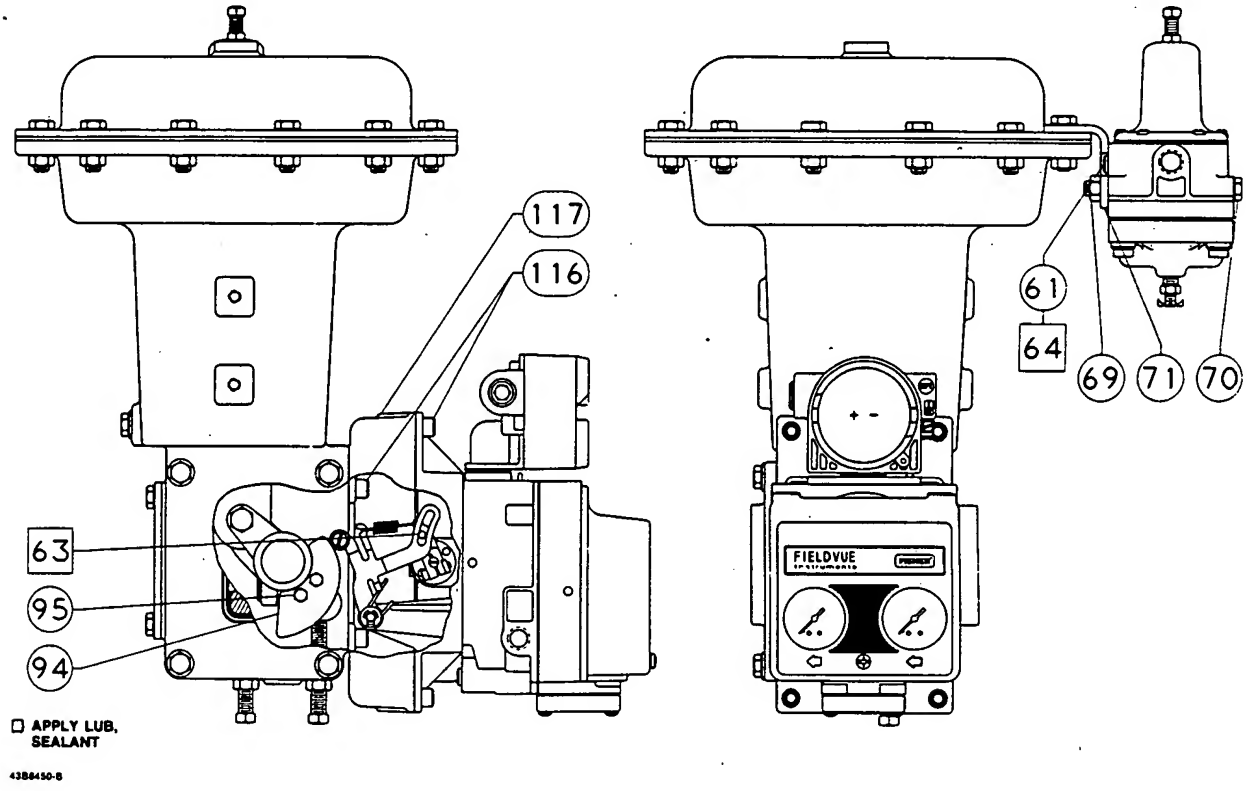


Figure 31. Type DVC5020 Series Digital Valve controller Mounted on Type 1052 Size 33 Actuator with Casing-Mounted Filter Regulator

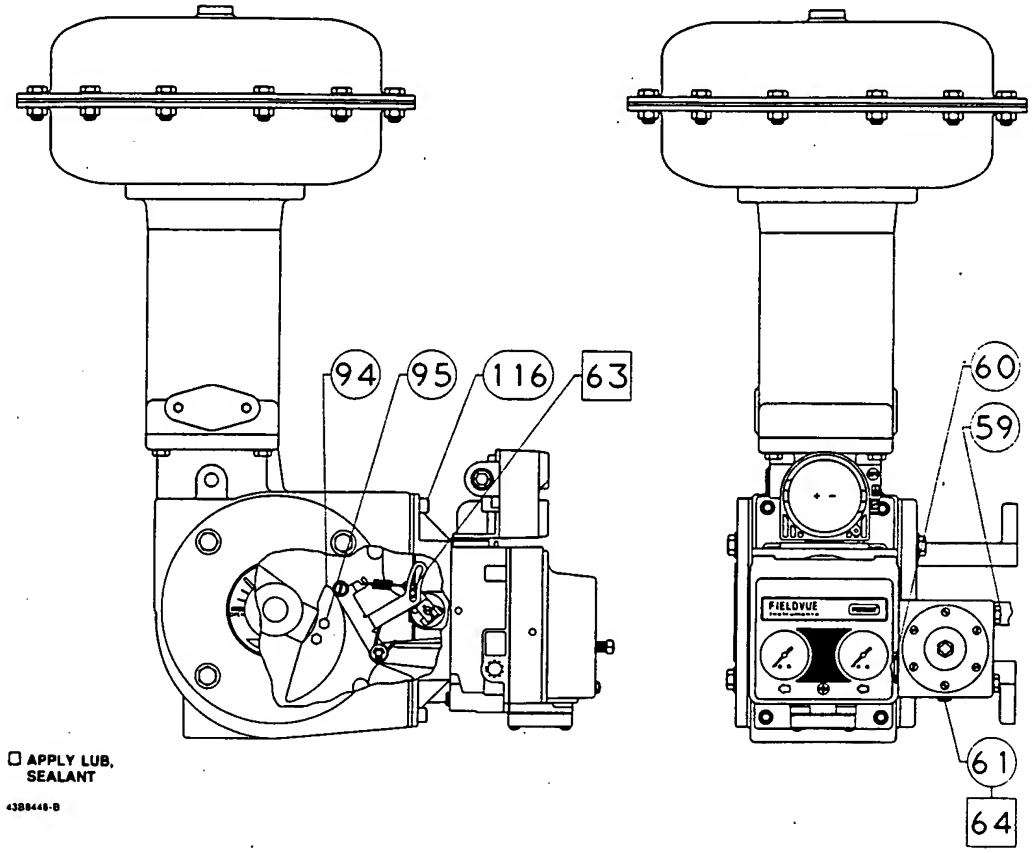


Figure 32. Type DVC5020 Series Digital Valve Controller Mounted on Type 1051 Size 40 Actuator with Integrally Mounted Filter Regulator

Type DVC5000 Series

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